

1997 Annual Wildlife Survey Report

Natural Resource Compliance and Protection Program

Rocky Flats Environmental Technology Site

Prepared for

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ACRONYMS AND ABBREVIATIONS

BEPA	Bald and Golden Eagle Protection Act
BZ	Buffer Zone
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act of 1980
CDOW	Colorado Division of Wildlife
CNHP	Colorado Natural Heritage Program
CWA	Clean Water Act
DOE	U.S. Department of Energy
DQO	data quality objective
ESA	Endangered Species Act
FNWA	Federal Noxious Weed Act
FWCA	Fish and Wildlife Coordination Act
IA	Industrial Area
IMP	integrated monitoring plan
MBTA	Migratory Bird Treaty Act
NEPA	National Environmental Policy Act
NRCPP	Natural Resource Compliance and Protection Program
NRDA	natural resource damage assessment
NTECA	Nongame, Threatened and Endangered Species Conservation Act
RFFO	Rocky Flats Field Office
Site	Rocky Flats Environmental Technology Site
USFWS	U.S. Fish and Wildlife Service

recorded on the Site during the monitoring period, indicating the Site's continued suitability as habitat for these species.

At the end of the 1997 field season, 249 terrestrial vertebrate species had been verified as using the Site's ecosystems. This is an impressive diversity when compared to the 322 terrestrial vertebrate species found at Rocky Mountain National Park, an area 98% larger than the Site. The Site's diversity includes 188 species of birds (19 are raptors), 3 big game species, 11 species of carnivores, 3 lagomorphs, 6 large rodents, 22 small mammal species, 9 reptiles, and 7 amphibians recorded since 1991. This high species diversity and continued use of the Site by numerous special-concern species verifies that habitat quality for these species remains acceptable and that ecosystem functions are being maintained.

1. INTRODUCTION

1.1 BACKGROUND

Rocky Flats Environmental Technology Site (the Site) is a U.S. Department of Energy (DOE) nuclear industrial facility that has been part of the nationwide nuclear weapons complex since 1951. The Site is located in rural Jefferson County, Colorado approximately 16 miles northwest of Denver, and 5 miles southeast of Boulder. The Site covers approximately 6,262 acres, of which approximately 5,900 acres forms an undeveloped Buffer Zone (BZ) around the central industrialized portion. The original 1951 land purchase included approximately 2,520 acres of rangeland, which was expanded by an additional 4,030 acres from private ranches in 1974 (some 290 acres were later allocated to the National Renewable Energy Laboratory). The Site adjoins undeveloped rangelands that are encroached by housing developments on the northeast and southeast. To the north, east, and northwest, public open-space lands border the Site. Figure 1-1 presents the general location of the Site.

The original mission of this DOE facility was the manufacture of nuclear weapons components. With the end of the Cold War and cessation of nuclear weapons production at the facility, the Site is undergoing cleanup and closure. One of the current DOE goals is to preserve the Site's unique ecological values. Ecological monitoring is necessary to ensure regulatory compliance and to preserve and protect these unique ecological resources to the maximum extent possible during cleanup and closure. The Natural Resource Compliance and Protection Program (NRCPP) provides such ecological monitoring.

1.2 THE NATURAL RESOURCE COMPLIANCE AND PROTECTION PROGRAM

The NRCPP monitors the status of plant communities, wildlife, and habitats to ensure that operations at the Site remain in compliance with state and federal wildlife protection statutes and regulations, and with DOE orders. Other goals of the program are to collect sufficient data to provide scientific basis for National Environmental Policy Act (NEPA) documentation and to support cleanup and closure of the Site.

The regulatory drivers for NRCPP wildlife and habitat work include:

- The Migratory Bird Treaty Act (MBTA) (USC 1973a)
- The Endangered Species Act (ESA) (USC 1973b)
- The Fish and Wildlife Coordination Act (FWCA) (USC 1958)
- The Federal Noxious Weed Act (FNWA) (USC 1975)

- The Bald and Golden Eagle Protection Act (BEPA) (USC 1978)
- The Colorado Nongame, Threatened and Endangered Species Conservation Act (NTECA) (CO 1991)
- The Clean Water Act (CWA) (USC 1977)
- The National Environmental Policy Act (USC 1970)
- The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (USC 1980)
- Executive Order 11990, Protection of Wetlands (EO 1977a)
- Executive Order 11988, Floodplain Management (EO 1977b)
- CFR Part 1022, Compliance with Floodplain/Wetlands Environmental Review Requirements (CFR 1979)
- CFR Part 230, 404(b)(1), Guidelines for Specification of Disposal Sites for Dredged or Fill Material (CFR 1980)
- DOE Order 4300.1B, Real Property Management (DOE 1989a)
- DOE Order 6430.1A, General Requirements, Construction Facilities and Temporary Controls (DOE 1989b)
- DOE Order 5400.1, General Environmental Protection Program (DOE 1988).

The NRCPP conducts routine surveys to monitor the health and populations of high-visibility and sensitive wildlife groups such as migratory birds, game species, indicator organisms (e.g., raptors and neotropical migratory birds are more sensitive to contaminants and stress), and species afforded special protection by federal and state statutes. In this document, all these groups are identified as "significant species" due to their ecological or regulatory significance. This ongoing monitoring program tracks population trends, habitat use, and species diversity from year to year, and is an important environmental management tool for DOE, Rocky Flats Field Office (RFFO) and its contractors. Data from these surveys, which are archived in the Site ecological databases, have been used in the preparation of environmental evaluations, remediation plans, environmental assessments, environmental impact statements, categorical exclusions, and project planning documents. These data are also used to make ecological resource management decisions to ensure the preservation of these resources at the Site.

Routine monitoring provides data on habitat affinities of sensitive species, which can then be used to predict the presence or absence of such species within planned work areas, avoiding the expense of additional special surveys. Availability of such information allows timely assessment of proposed actions for potential ecosystem impacts, thus reducing project delays. These data are therefore a valuable planning tool that can help avoid conflicts between project scheduling and protective regulations.

2. METHODS

Site ecologists use several methods to monitor the presence of wildlife, habitat use, seasonal residence, species densities, breeding areas, and other pertinent wildlife parameters. Significant species observations are recorded by grid location (Figure 2-1), whether observed during the sitewide significant species survey, multi-species census surveys, or migratory bird surveys. Multi-species census surveys, performed on established transects, record all wildlife observed. Monthly sitewide surveys along established roads over the entire Site record all significant species. Project-specific work-area surveys record the presence or absence of any special-concern species and confirm the presence and/or locations of wetlands within project areas. Migratory bird surveys record bird species along established transects. In addition to these formal surveys, fortuitous sightings of any significant species are recorded (these may occur during the above surveys). Figure 2-2 shows multi-species census survey routes, and Figure 2-3 shows migratory bird survey transect routes.

2.1 DATA COLLECTION

2.1.1 Significant Species Data Collection

Significant species are species of special interest because of their status as high-visibility species, indicator organisms, sensitive species, federal and state protected species, or game species. Significant species groups include waterfowl, big game mammals, game birds, carnivores, raptors (birds of prey), small game mammals, furbearers, and selected other species. A list of species currently designated as significant is presented in Appendix A.

2.1.1.1 Multi-Species Census Surveys

Multi-species census surveys are performed monthly on 16 established survey routes, allowing long-term data collection on survey transects included in the NRCPP ecological databases. Monthly performance of these surveys allows collection of data to characterize habitat/area use and estimate the relative abundance of significant species year-round. Transect routes vary in length (generally at least a mile) in all major habitat types at the Site. The major habitats recognized at the Site include wetlands, riparian (streamside) woodland, riparian shrubland, tall upland shrubland, mesic mixed grassland, xeric mixed grassland, and reclaimed grassland. Table 2-1 presents a list of transects and habitat descriptions for the multi-species surveys. See Figure 2-2 for transect locations.

Multi-species census surveys are performed in accordance with procedures described in the *EMD Operating Procedures Manual Volume V* (DOE 1994c). Surveys are performed

by a qualified ecologist who walks established transects in specific habitats and records data for all animal species observed during the survey. Significant plant species encountered during these surveys are also recorded. Multi-species census surveys are designed to collect data on species richness, species abundance, area use, and habitat use. Data recorded include species, number of individuals, habitat, activities, age and sex classifications, and other pertinent information. Data are recorded as habitat use per minute of observation time. These data provide information on what habitats are used by which species, how often, and for what purposes.

2.1.1.2 Sitewide Significant Species Surveys

Sitewide significant species surveys are conducted monthly along all main roads in the BZ. Preference is given to fair weather to optimize observation ability and driving conditions. During these surveys, all visible individuals of significant species observed during a short time span (i.e., 3 to 4 hours) over the entire property are recorded. These surveys may be performed diurnally (during the day) or nocturnally (during the night).

Diurnal sitewide surveys are performed monthly. Nocturnal surveys are normally performed in August or September between dusk and midnight. The nocturnal survey method provides coverage over the entire BZ in areas that can be seen with the beams of hand-held spotlights. The primary purpose of these nocturnal surveys is to document the presence of nocturnal species that are rarely observed during daylight hours.

2.1.1.3 Project-Specific Special-Concern Species and Wetland Surveys

Special-concern species are a particular class of wildlife and plants that are of special interest at the Site because of their protected status or rarity. These species have been designated on the basis of their rare or imperiled status, as identified by the U.S. Fish and Wildlife Service (USFWS), the Colorado Division of Wildlife (CDOW), the Colorado Natural Heritage Program (CNHP), and other interested groups. Species placed in this category by the NRCPP are federally listed threatened and endangered species; species proposed by the USFWS for listing (e.g., the Preble's meadow jumping mouse); species formerly listed by the USFWS as candidate species; Colorado threatened, endangered, or Colorado Species of Special Concern; species from the CNHP lists of rare and imperiled species; and species that are "watch-listed" by other regulatory or natural resource conservation groups. Special-concern species tracked by the NRCPP are listed in Appendix B. The NRCPP monitors the presence, locations, and numbers of these species to better ensure the Site's compliance with the applicable acts and regulations, and to provide appropriate protection for these species.

Project-specific surveys for special-concern species are performed in accordance with the ecology procedure *Identification and Protection of Threatened, Endangered, and Special-Concern Species* (1-D06-EPR-END.03) (DOE 1994a). Project-specific migratory bird surveys are performed in accordance with the ecology procedure *Migratory Bird Evaluation and Protection* (1-G98-EPR-END.04) (DOE 1994b). Wetlands

surveys are performed in accordance with the ecology procedure *Wetland Identification and Protection* (1-S73-ECOL-001)(DOE 1997). Locations for project-specific surveys are determined by the work plans for construction, assessment, and remediation projects.

2.1.1.4 Fortuitous Observations

Fortuitous observations are chance observations of significant species during performance of other surveys not designed to target these species, or observations made during other activities. Such observations provide important information on species presence, and clues about habitat use, and location affinity, particularly for the rarer species at the Site.

2.1.1.5 Special-Concern Species Surveys (Preble's Meadow Jumping Mouse)

Trapping Methods— Trapping of Preble's meadow jumping mice and other small mammals followed the procedures outlined for small mammals in the *EMD Operating Procedures Manual Volume V* (DOE 1994c) and conformed to the U.S. Fish and Wildlife Service *Interim Survey Guidelines for Preble's Meadow Jumping Mouse* (USFWS 1997). Different goals were addressed in different parts of the 1997 trapping program, so trap setup varied by location. See Appendix C for greater detail on methodologies used during this trapping program.

In Walnut Creek, the goal was to verify the continued presence of the mouse. The trapping transects used 60 traps set in two rows of 30 traps each, parallel to the streambed. Trapping began in early May and continued until early June 1997. Trapping was discontinued once Preble's mice were captured.

The goals in Woman Creek were more elaborate. This portion of the study was designed to verify the continued presence of the mouse between Ponds C-1 and C-2 and downstream from the Operable Unit 5 Landfill, to assess the significance of surface-water availability in the mouse's habitat selection; and to determine whether the mouse prefers a particular type of riparian vegetation. Transects along Woman Creek used two rows of 25 traps each. The parallel rows were spaced approximately 10 m apart on opposite sides of the creek, with the traps in each line separated from each other by approximately 5 m. These transects were located such that each of the nine combinations of hydrologic and vegetation conditions occurring along Woman Creek was sampled. The Woman Creek trapping effort was divided into two sessions: early (June 3 to July 10, 1997) and late (August 12 to September 18, 1997). The transects were run for 500 trap-nights once each session.

Data collected for each small mammal captured included species, age, sex, and breeding condition. Each Preble's mouse was measured for key identifying characteristics, including head and body length, tail length, hind foot length, and body weight. Each

captured Preble's mouse was examined for identification marks to determine whether it had been captured previously or was a new individual. If the individual was marked, the unique identifying code was recorded. New Preble's mouse captures were marked by ear punches, or with food coloring.

Habitat Characterization—Habitat characterization was performed only in the nine Woman Creek transects. Primary and secondary habitat types were determined for each trap station. These habitat types correspond to those used on the Site-Wide Vegetation Types Map (K-H 1997b). The habitat types at trap stations were determined using a visual estimate of the dominant and secondary vegetation type present.

Detailed habitat characterizations were performed at 10 randomly pre-selected trap stations for each transect. If Preble's mice were caught in a given transect, trap stations where they were caught were substituted for the same number of pre-selected stations. This habitat characterization took place between the two trapping sessions.

Three types of habitat information were recorded within a 3-m radius (28.3 m^2) of the selected trap stations: plant species composition, physical habitat, and vegetation structure. Physical habitat composition measurements are non-vegetative, abiotic features of the habitat. To characterize vegetation structure, the vertical area above the trap station was divided into four strata, including trees, tall shrubs, sub-shrubs, and herbaceous plants. For greater detail on habitat characterization methodology, refer to Appendix C.

2.1.2 Migratory Bird Surveys

Migratory bird breeding and seasonal species richness and population density data were collected along 20 permanent survey routes (transects) established in all major habitats at the Site. Surveys of these transects were performed by a qualified ecologist who walked the established routes and recorded data for bird species encountered along the survey belt. Table 2-2 lists survey routes and general habitat types for each transect. Figure 2-3 shows the locations of these routes. Migratory bird surveys were designed to collect habitat use and population data for all bird species in different habitats within the BZ. Breeding bird surveys were conducted along these permanent transects at closely spaced time intervals (weekly) during the early summer breeding season. Monthly surveys were performed during the remainder of the year. Migratory bird surveys were performed in accordance with the *EMD Operating Procedures Manual* (DOE 1994c).

2.2 DATA ANALYSES

As standard practice, data entry into the Ecological Database is verified and validated to ensure accuracy before data analysis is performed. Corrections are made to entered data as required, and all summary tables used for data analysis are based on the quality-assured data (K-H 1997c).

2.2.1 Multi-Species Census Data Analyses

The Ecological Database was queried to determine habitat use preferences of each species of interest and the relative abundance of those species. Summary tables for species and/or species groups were then prepared, and the percentages of observations in each habitat were compared to determine habitats of major importance to individual species or species groups, and to determine the relative abundance of those species.

2.2.2 Significant Species Area Use

Area use summaries were derived by querying the sitewide significant species survey data in the Ecological Database for grid points from observations of each species. Figure 2-1 shows the grid used to record location data. Summary tables were then prepared to facilitate mapping for each major species group. While preliminary maps were produced for all significant species during data analyses, only selected maps are presented in this report.

2.2.3 Special-Concern Species (Preble's Mouse) Data Analyses

Data analyses for the Preble's mouse trapping effort were divided into two major categories: habitat characterization and trapping results. Data analyses for habitat characterization included developing a general discussion of the corridor vegetation description, and a more detailed analysis of the habitat types at the trap locations.

2.2.3.1 Analyses of Habitat Characterization Data

Preble's mouse habitat characterization data were divided into two categories: data from successful transects and data from unsuccessful transects. Transects within these two categories were then compared according to shared characteristics, such as vegetation community and hydrotype. Treating an entire transect as successful or unsuccessful was a change from previous habitat characterization efforts (K-H 1996a; DOE 1995), where individual trap stations were considered either successful or not, giving little consideration to the habitat contained in the rest of the transect, which may have influenced capture success.

The successful transects were compared to the unsuccessful transects by looking at the specific measurements made at the selected trap stations. Classification of a transect as either "woody" or "herbaceous" was a subjective, *a priori* assignment made on the basis of Site vegetation maps and visual reconnaissance surveys. Transect classification by hydrotype was based on a previous hydrology study (EG&G 1995c) at the Site.

Cover data were estimated using specific cover classes (see Appendix C). Because stem density and density distribution data were gathered using classes that could not be transmitted into mid-point values, they were tallied by frequency distributions.

Data to be analyzed statistically were first examined for normality and variance differences. Where normality and variance requirements were met, t-tests were used to test the difference between means. In cases where normality and/or variance requirements were not met, Mann-Whitney U tests, Mann-Whitney W tests, and Kruskal-Wallis tests were used to test for differences between medians, as appropriate (Fowler and Cohen 1996; Conover 1971; Manugistics 1994). Statistical analyses not calculated by hand were conducted using Statgraphics Plus software (Manugistics 1994). The Sorenson coefficient of similarity index (Brower and Zar 1977) was used to examine the similarity in species composition (based on presence/absence data) among the different categories of comparison listed above.

As an additional means of comparison, two cover indices were created, one for woody cover and one for herbaceous cover. An index of overall woody vegetation cover was devised to estimate combined tree, shrub, and sub-shrub canopy cover (see Appendix C for further detail).

2.2.3.2 Analyses of Trapping Data

Data from the Walnut Creek trapping effort were collected to determine if the Preble's mouse was present at the targeted locations. The subspecies was either present or absent. No further analysis was performed. In Woman Creek, capture results were compared to results from previous trapping efforts in that drainage, and relative abundance was calculated on the basis of captures per 100 trap-nights. Capture frequency was also analyzed to determine when the peak capture periods occurred. Preble's mouse distribution was compared to the distribution of other small mammal species within the habitat studied. This was accomplished through comparison of relative abundance of other species against relative abundance of Preble's mice. Data were also examined for indications of distance moved by any marked and recaptured mice.

2.2.4 Bird Species Richness and Density Analyses

Quality assured data sets from 1991 and 1993–1997 were analyzed using four community measures: species richness, species diversity, population densities, and community similarity. A modified Simpson's Index was used as a measure of diversity (Hair 1980). Bird density was calculated as number of individuals per hectare of each bird species using the Leopold method (Emlen 1971, 1977). Comparisons of bird community similarity were based on the Simple Matching coefficient of similarity (Brower and Zar 1977).

Calculations were done by habitat as well as for Site-wide observations. The data sets were modified to eliminate ad hoc "flyover" observations. Flyovers are observations of

birds in flight above the transect. Many flyovers were assumed to be birds in transit to other locations and therefore not representative of species actually using the habitat represented by the transect. However, some species typically feed "on the wing" and were assumed to be actively using the habitat even if they were recorded as flyovers. To accommodate this variability, all flyover observations were removed from the data sets before analysis *except* those listed in Table 2-3.

3. RESULTS AND DISCUSSION

The following sections present summaries of wildlife monitoring performed under the NRCPP during 1997. Comparisons with previous years are made in the discussions for each species group. Many of the data are summarized by season. For the purpose of this document, seasons are defined as spring (March through May), summer (June through August), fall (September through November), and winter (December through February). In the case of migratory bird summaries, winter data comprises data from December of 1997 and January and February of 1998, to allow better seasonal interpretation. Detailed summaries of multi-species survey results are presented in Appendix D.

3.1 SIGNIFICANT SPECIES

Significant species monitored during 1997 included big game mammals, large rodents and lagomorphs, carnivores, waterfowl, raptors, herptiles (reptiles and amphibians), and special-concern species. A list of the species included in these groups is provided in Appendix A. The data entry process for significant species is also described in Appendix A. Discussions in the following sections concentrate on the various significant species groups.

It should be noted that two types of surveys (as discussed in Section 2) were used in collecting data on the wildlife groups discussed below. Sitewide significant species surveys recorded primarily area use, but they also recorded instantaneous habitat use for all significant species observed in a short time span over the entire Site. Multi-species census surveys provided data on habitat use per unit time of observation along permanently established walking transect lines. Results from both methods are discussed below.

3.1.1 Big Game Mammals

The most common big game species at the Site is the mule deer (*Odocoileus hemionus*). Relative abundance of mule deer by habitat is discussed in Section 3.1.2.2. The current population at the Site is estimated at 145 individuals. This estimate is based on a winter deer count, extrapolated to take into account the well-known fact that ungulate herds are routinely underestimated (Wallmo 1981). Site knowledge allows the ecologists to extrapolate observed numbers to a population estimate based on assumed underestimation from some areas of the Site. A single mule deer/white-tailed deer hybrid buck has been resident at the Site for the past several years and was recorded again in 1997. No elk were recorded on the Site in 1997.

White-tailed deer (*Odocoileus virginianus*) continue to populate the Site in small numbers. White-tailed deer does have been observed more often with herds of mule deer than in the past. A small group of two to five individuals was recorded in lower Woman Creek several times during 1997. During the baseline characterization (DOE 1992), no white-tailed deer were recorded, but observations have increased in recent years to several per year. At present, a group of six individuals is commonly observed in lower Woman Creek and Smart Ditch. The two deer species do hybridize, which may cause a management concern for the Site, because such hybridization could affect the long-term viability of the Site's mule deer herd. The population trend of white-tailed deer thus bears further observation.

3.1.1.1 Sitewide Significant Species Surveys—Big Game

Winter Deer Count Comparison—A sitewide survey conducted on December 30, 1997 for the purpose of obtaining a midwinter population count of big game at the Site recorded 132 mule deer and one white-tailed deer doe. Winter surveys such as this are weather dependent, and often, not all deer present at the Site are visible to observers or identifiable by age and sex. It should be noted, however, that the winter count has fluctuated since 1994, when the highest count of 164 deer was recorded. The count was 143 mule deer in January 1995, 118 in January 1996, and 122 in January 1997. Figure 3-1 shows the winter mule deer population trend from 1994 to 1997.

The age class breakdown continues to indicate a fawn survival rate of approximately one fawn for every two does (1:2). The number of fawns recorded in December 1997 (27) was approximately 87 percent of the mean winter fawn count over the past four years. It should be noted that censuses of mule deer normally yield low counts of fawns (Wallmo 1981). To better assess fawn survival as it relates to the health of the Rocky Flats herd, a spring 1998 deer count will be performed. Although opinions vary among mule deer population authorities, a fall-season fawn-to-adult ratio of 30:70 is considered to be optimum for maintaining the herd (Fitzgerald et al. 1994). The December 1997 count showed 21 percent young of the year, and some individuals likely went unrecorded. It should be noted that this number cannot be correlated directly to a fall count, because some winterkill occurs among deer herds during late fall and through the winter. A fall-season count in November 1997 recorded too few mule deer to be conclusive.

The number of bucks counted in December 1997 (42) remained virtually the same as in January 1997 (41). The ratio of does (63) to bucks (42) was approximately 2.7:1, showing a good balance for a healthy herd. According to Wallmo (1981), a sex ratio of approximately two adult does per one adult buck indicates a very healthy mule deer population. The variations in mule deer numbers recorded at the Site probably represent normal population fluctuations, but in general, other wildlife professionals, especially Site visitors from the Colorado Division of Wildlife, are encouraged and impressed with numbers at the Site. Figure 3-2 shows the age- and sex-class breakdown of the mule deer population from 1994 to 1997.

The number of deer present in the BZ (approximately 17 deer/ha or 13 deer/mi²) remains fairly stable, and is due to good range condition and the protection afforded them by the prohibition of hunting within Site boundaries. The lack of constant disturbance in the BZ also provides protection from stress, and normally promotes a good fawn survival rate.

Big Game Area Use Summary — In this section, monitoring data from 1997 sitewide significant species surveys are summarized by season (spring, summer, fall, and winter). Area use data are an important tool used by Site ecologists in helping project planners time disruptive activities to avoid critical periods or essential habitat. Seasonal summaries of mule deer use at the Site reflect the species' strong year-round preference for some locations and seasonal preferences for other locations. Changes in scheduling may be all that is necessary to avoid impacts to important species.

The use patterns reflect two apparent area preference criteria. One preference is for specific seasonal habitat that meets certain survival requirements (e.g., protective cover for new fawns). A second important area preference is for secluded areas. Some areas preferred by the deer do not provide unique habitat but do offer isolation from disturbance. There were no remarkable changes in area use in 1997. Figure 3-3 shows seasonal mule deer use areas in 1997.

Mule Deer Spring Area Use. During the spring of 1997, mule deer area use at the Site was the least dispersed of all the seasons, and mirrored longer-term use patterns discussed in the 1995 annual report (RMRS 1996). Snow-free, south-facing hillsides (where green-up occurs earliest) were most preferred, as were locations providing the best refuge and thermal cover from residual winter storms that are common during March and April. Areas with the heaviest mule deer use were upper Rock Creek, the lower Rock Creek shrublands unit, south-facing hillsides in the upper Smart Ditch drainage basin, and the lower Walnut Creek drainage. Several areas in the xeric tallgrass prairie community were also used frequently when the weather was not severe. The 1997 area use data summary for mule deer is provided in Table 3-1.

Mule Deer Summer Area Use. Summer area use patterns in 1997 also mirrored those found in the four-year summaries presented in the 1995 annual report (RMRS 1996). Mule deer use during the summer was quite dispersed, with high use recorded in the upper Rock Creek shrublands and riparian woodland portions of Woman Creek, Walnut Creek, and Smart Ditch. At the start of the summer season (June), fawning occurs, and by the end of the season (August), the young of the year are gaining independence. Areas of heavy concentration are limited in extent, and reflect heavy use by does with fawns or by buck groups. Adequate cover to conceal young, and isolation and security, are requirements for fawning habitat (WGFD 1985). Does with dependent fawns show a strong preference for areas with tall upland shrubland and riparian woodland habitats such as are found in upper Rock Creek and along the bottomland areas of the Woman Creek and Smart Ditch drainages. Rock Creek's tall upland shrubland habitat is ideal for fulfilling these requirements. Bucks are drawn to areas that provide seclusion and shade cover during this season. These areas include Rock Creek shrubland units, and areas in

the Smart Ditch drainage basin. Mature bucks are seldom found in the company of does with young during this season (see Table 3-1 for a data summary).

Mule Deer Fall Area Use. Mule deer use patterns during the fall of 1997 were similar in location and extent to the spring use patterns. These, too, mirrored the longer-term summary presented in the 1995 annual report (RMRS 1996). The most concentrated fall use was within the upper Rock Creek drainage, Antelope Spring, and Apple Orchard Spring. Certain areas of xeric tallgrass prairie were also high-use areas. This reflects the tendency of the species to concentrate in these areas during the November breeding season (the rut). During the rut, large mixed-sex groups of mule deer were observed frequently in the open grassland areas, often at the same location for several days at a time. The 1997 area use data summary is provided in Table 3-1.

Mule Deer Winter Area Use. Winter mule deer area use at the Site during 1997 was fairly dispersed, with preferences shown for upper Rock Creek and the Woman Creek and Smart Ditch bottomlands. Additionally, a pattern of use on south- and southeast-facing mesic grassland hillsides was evident. Some winter use patterns clearly reflect the thermal advantages provided by the preferred areas. Other winter use areas provide better quality, or more available forage, with reduced procurement effort (i.e., a better energy return for the effort). Upper Rock Creek, for example, provides refuge from the frigid northwest winds of the winter months because of its steep topography, narrow valleys, and orientation perpendicular to the prevailing winter winds. South- and southeast-facing slopes provide the greatest incident thermal energy, as well as the best snow-free forage areas. Even as early as late January, many of the early forbs and grasses on these slopes are greening up for spring growth, and provide good early-season forage. The 1997 area use data summary is provided in Table 3-1.

White-Tailed Deer Area Use. White-tailed deer have been observed as single does with mule deer groups in widely scattered areas from upper Rock Creek to lower Walnut Creek and lower Woman Creek. White-tailed bucks are observed most consistently with small white-tailed deer groups in lower Woman Creek and lower Smart Ditch (Table 3-1).

3.1.1.2 Mule Deer Relative Abundance by Habitat from Multi-Species Census Surveys

Mule deer habitat used varied by season (Table 3-2). Mesic mixed grasslands were most heavily used in winter, with a relative abundance of 1.640 observations per minute (80% of use), and spring, with 0.911 observations per minute (41% of use). Tall upland shrubland was most heavily used in summer, with 0.170 observations per minute (38% of use), followed closely by mesic mixed grassland with 0.169 observations per minute (14% of use). During fall relative abundance of mule deer was highest in tall upland shrubland 0.247 observations per minute (37% of use), and mesic mixed grassland 0.355 observations per minute (17% of use). The greatest variety of habitats (10) was used during the summer, with four used in spring, seven in fall, and six in winter.

As illustrated throughout Table 3-2, the relative abundance of mule deer varies by season and habitat. Mule deer relative abundance varied throughout the year, with sitewide relative abundance ranging from 0.158 observations per minute of observation in winter to 0.071 in summer.

3.1.1.3 White-Tailed Deer Habitat Use from Multi-Species Census Surveys

Habitat use summaries based on multi-species census surveys (Table 3-2) indicate that white-tailed deer use shrublands and grasslands almost equally. The majority of the white-tailed deer observations were of individuals with groups of mule deer. During 1997, small groups (2-5 individuals) of white-tailed deer continued to use the lower Smart Ditch/lower Woman Creek area. Single does were observed most often with mule deer groups around the A-Ponds, in upper and middle Rock Creek, and in lower Walnut Creek. The present total population at the Site may be as many as 10 to 15 animals.

3.1.2 Lagomorphs and Large Rodents

The most commonly observed lagomorph (rabbit or hare) at the Site during 1997 was the desert cottontail (*Sylvilagus audubonii*), with a mean sitewide annual relative abundance of 0.005 observations per survey minute. White-tailed jackrabbits (*Lepus townsendii*) and black-tailed jackrabbits (*Lepus californicus*) have been recorded, but individuals of both species are seldom observed, and during sitewide significant species surveys and multi-species census surveys, only tracks were observed during 1997. There were, however, two white-tailed jackrabbits recorded as fortuitous observations. Desert cottontails, as in previous years, were most abundant in disturbed areas, scrap storage areas, trailer yards, conex storage areas, rip-rap areas, and other areas affording cover. Jackrabbits were also found near disturbed areas, and but were most abundant in xeric mixed grasslands at the Site. Table 3-3 provides a summary of recorded seasonal habitat use and relative abundance by habitat for these species, based on multi-species census surveys. The 1997 area use data summary, based on sitewide surveys, is provided in Table 3-4.

Muskrats (*Ondatra zibethicus*) were most abundant in impoundments (ponds), most often in association with cattails (*Typha* sp.), during 1997. Populations of this species are difficult to estimate without a heavy trapping regimen, but observations in 1997 confirmed the continued presence of the species in appropriate habitat. Table 3-4 summarizes recorded area use by this species.

Signs of porcupines (*Erethizon dorsatum*), now a protected species within the State of Colorado, were observed in tall upland shrubland, and one individual was recorded in riparian woodland. All 1997 observations were within the Rock Creek drainage, and were made fortuitously during various field activities. The porcupine's preferred forage species at the Site are hawthorn (*Crataegus* sp.), chokecherry (*Prunus virginiana*), and ponderosa pine (*Pinus ponderosa*), all of which are most abundant in upper Rock Creek.

The presence of this species at the Site is significant, because it verifies that the habitats at the Site are sufficiently diverse to support such increasingly rare species.

Black-tailed prairie dog (*Cynomys ludovicianus*) populations in the vicinity are slowly rebounding from the regional die-off that was caused by the plague epizootic in 1994. Prairie dogs were once established in several colonies at the Site, and had started to repopulate historical colony areas by the end of 1997. Observations were made in two separate locations of the southeast BZ, with small groups of three to five recorded. Until populations rebound to previous densities, specific prairie dog censuses are unnecessary.

Prairie dog populations at the Site are of interest, because the number of wintering raptors that can be supported by the Site is directly correlated to the prairie dog population. Long-term nesting success of the Standley Lake bald eagle pair may ultimately depend on sufficient prairie dog populations in the vicinity, including any populations at the Site.

3.1.3 Carnivores

The most frequently observed carnivore species at the Site is the coyote (*Canis latrans*), and the next is the raccoon (*Procyon lotor*). Coyotes, which are active both diurnally and nocturnally, were found in all habitats, but were most visible in marshlands and grasslands as they hunted small mammals during the day. Mean annual sitewide relative abundance for coyotes was 0.008 observations per minute of survey observation. Relative abundance values ranged from 0.017 in winter to 0.001 in summer. Differences in observation rates may have been influenced by vegetation density since high vegetation in summer reduces the species' visibility.

Three coyote dens and several juveniles were observed in 1997, confirming that the Site's coyotes successfully reproduced during the year. Typically, three to four coyote natal dens are located each year at the Site. The estimated number of coyotes on the Site, based on results from sitewide surveys and Site knowledge, remains at approximately 14-16. Table 3-5 provides a seasonal habitat use summary for carnivores in 1997 based on multi-species census survey data. This summary presents primarily coyote relative abundance since most other species are nocturnal, and are seldom observed during day-time surveys. The 1997 area use data summary, based on sitewide significant species surveys, is provided in Table 3-6.

Raccoons are largely nocturnal, and are therefore most frequently documented from tracks or through small-mammal trapping activities. (Site ecologists often intentionally trap raccoons to remove them from the vicinity of small-mammal traplines, because of the raccoons' penchant for robbing bait from the traps.) Raccoons were observed in both the Industrial Area (IA), where they frequented areas with food refuse, and the BZ near riparian channels and pond margins. The limited number of observations precludes making an accurate population estimate.

A black bear (*Ursus americanus*) was recorded several times across the Site in 1997. This may have been the same individual that was recorded in 1996. The bear was

observed within the IA near Building 130, near the West Access Road, and in upper Woman Creek, and signs of its foraging activity, tracks, and scat were recorded in upper Rock Creek and lower Woman Creek.

The presence of several mammalian carnivore species, the top species in the food chain, is an indication of the good ecological condition of the Site. While this program does not attempt to track numbers of all carnivores at the Site, the steady estimate of coyote population over time is a good indication that prey species continue to be abundant. The top carnivores in an ecosystem must have a large, healthy population of prey species upon which to subsist. Reduced numbers of prey species are normally reflected in reduced species richness of carnivores.

3.1.4 Waterfowl (Ducks, Geese, and Shorebirds)

As would be expected, the majority of the 33 waterfowl species observed during sitewide significant species surveys and multi-species census surveys were concentrated around the impoundments (ponds). Habitat use reflected the strong preferences for open water, pond-margin mudflats, and associated wetlands (Tables 3-7 and 3-8). Area use varied somewhat between the fall/winter and spring/summer seasons. Fall/winter area use was heavily concentrated on the major impoundments at the Site, while spring/summer use was more dispersed. Some observations during the breeding season occurred along creeks, in ditch and creek pools, and in greening-up grasslands. Two new species of wading birds were observed during 1997: the American bittern (*Botarus lentiginosus*), and the semipalmated sandpiper (*Calidris pusilla*). Of this group, 14 species have been documented as breeders or suspected breeders at the Site.

Most waterfowl and shorebirds were observed on the large impoundments at the Site. Diving ducks, such as buffleheads (*Bucephala albeola*), ring-necked ducks (*Aythya collaris*), redheads (*Aythya americana*), and lesser scaup (*Aythya affinis*), were most commonly observed in the deeper ponds (A-3, A-4, B-5, C-2, and D-2). Species found more generally in shallow waters included blue-winged teal (*Anas discors*), green-winged teal (*Anas clypeata*), mallards (*Anas platyrhynchos*), cinnamon teal (*Anas cyanoptera*), and gadwall (*Anas strepera*). Puddle-ducks, primarily mallards, were also observed in pools, at seeps, and along creeks. Great blue herons (*Ardea herodias*) were observed on impoundment mudflats, and in ditches, short marshland, and wet meadows.

The most abundant year-round waterfowl at the Site during 1997 were mallards, with 476 observations during multi-species census surveys (Table 3-7). The mean annual sitewide relative abundance of mallards was 0.087 observations per minute of survey. Relative abundance ranged from 0.163 in summer to 0.015 in winter. The relative abundance of most other waterfowl species varied seasonally. Aside from the abundant mallards, the most abundant species in winter was the redhead (0.049 observations per minute), as recorded in multi-species census surveys. Green-winged teal (0.059 observations per minute) and gadwalls (0.036 observations per minute) were the most common spring species. Pied-billed grebes (*Podilymbus podiceps*) (0.038 observations per minute) and American coots (*Fulica americana*) (0.030 observations per minute) were the most

abundant summer species. In fall, the most common species were gadwalls (0.052 observations per minute), ring-necked ducks (0.049 observations per minute), and buffleheads (0.047 observations per minute).

Several waterfowl species raised young at the Site during 1997. Brood counts and other observations confirmed nesting by killdeer, pied-billed grebes, American coots, mallards, blue-winged teal, Canada geese, and cinnamon teal.

The species richness of waterfowl indicates that waters at the Site are of sufficient quality to attract large numbers of waterfowl, including several species that nest at the Site yearly. Species richness ranged from a high of 24 species in spring to a low of 6 during winter. Sixteen species were recorded as resident during the breeding season. A number of the waterfowl species stop over during migration because of the diverse aquatic communities in the ponds and, to a lesser degree, the creeks on the Site. Figure 3-4 shows a comparison of species numbers observed since 1993. A decline in the species richness or numbers of waterfowl could be an early warning of declining water quality at the Site.

3.1.5 Raptors

Raptors observed at the Site include all those normally associated with the range and habitats of this area of Colorado (Andrews and Righter 1992). Raptor species using the Site varied between the spring/summer and fall/winter seasons, with great horned owls (*Bubo virginiana*), red-tailed hawks (*Buteo jamaicensis*) and American kestrels (*Falco sparverius*) remaining as year-round residents. Swainson's hawks (*Buteo swainsoni*), turkey vultures (*Cathartes aura*), and long-eared owls (*Asio otus*) were observed on the Site only in spring/summer. Rough-legged hawks (*Buteo lagopus*), northern harriers (*Circus cyaneus*), bald eagles, and golden eagles (*Aquila chrysaetos*) were largely observed in fall/winter. Peregrine falcons, though rarely observed, are most common in fall. These are most likely migrating individuals.

Among most raptors, demonstrated habitat preferences are divided between woody habitats (roosting and nesting areas) and grasslands and wetlands (foraging habitats) (see Table 3-9). Falcon species were observed most frequently where their preferred prey (largely songbirds) was concentrated, commonly in riparian woodlands and shrublands. An exception was nesting American kestrels, which were associated with buildings. Being nocturnal, great horned and long-eared owls normally were recorded in roosting locations during daytime surveys (shrubland, woodland, and abandoned buildings). Buteos (the broad-winged hawks), including roughlegged, red-tailed, and Swainson's hawks, were most often observed either roosting or nesting in riparian woodland, or soaring over marsh and grasslands where their prey is most abundant.

One new raptor species was recorded using the Site in 1997. Ospreys have been seen in the vicinity, normally around Standley Lake, for several years, but had not been observed at the Site. In 1997, ospreys were observed around impoundments in Smart Ditch and Walnut Creek.

Red-tailed hawks, Swainson's hawks, great horned owls, and American kestrels nested at the Site in 1997. Figure 3-5 shows the locations of nests active in 1997.

Recorded area use varied somewhat by season, but raptor observations were generally well dispersed across the Site during all seasons. Except within nesting territories, no particular concentration of activity was noted for any given species. Table 3-10 summarizes seasonal area use by raptors.

Relative abundance of raptors was variable by season, but the most abundant species year round was the great horned owl with a mean annual relative abundance of 0.009 observations per minute of survey. The American kestrel is also a year round resident with a mean relative abundance of 0.003 observations per minute. The red-tailed hawk's spring through fall mean relative abundance was 0.003 observations per minute. The remaining species had a relative abundance of .001 observations per minute during the seasons they were present.

The continued presence of nesting raptors at the Site in 1997 indicates that habitat quality and protection from disturbances have contributed to making the Site a desirable location for raptors to reproduce. The normal seasonal species assemblages of raptors were observed at the Site, indicating that the habitat still provides the essential seasonal requirements for these species. Numbers and species richness remained similar to previous years, indicating that the Site probably supports the optimum population of these territorial species. Figure 3-6 shows a comparison of species numbers observed since 1993.

3.1.6 Herptiles (Reptiles and Amphibians)

Herptile species observed during 1996 included the boreal chorus frog (*Pseudacris triseriatus maculata*), northern leopard frog (*Rana pipiens*), Woodhouse's toad (*Bufo woodhousei*), western painted turtle (*Chrysemys picta*), eastern short-horned lizard (*Phrynosoma douglassii brevirostra*), the western plains garter snake (*Thamnophis radix*), wandering garter snake (*Thamnophis elegans*) (a new species for the Site), the red-sided garter snake (*Thamnophis sirtalis*), and the prairie rattlesnake (*Crotalus viridis*).

Observations of these species were sporadic and widely dispersed, and the majority of observations were fortuitous (Table 3-11). Habit preference of herptiles varied by species. Table 3-12 presents habitat use as recorded during multi-species census surveys. The 1997 area use data summary from sitewide significant species surveys is presented in Table 3-13.

Species presence of several sensitive reptile and amphibian species is another indicator of ecosystem health within the various habitats at the Site. Obtaining a census of these species is difficult; therefore, estimates of populations cannot be made from the data presented here.

3.1.7 Special-Concern Species

Special-concern species are defined in Section 2.1.1.3. While the majority of the special-concern species that do or have potential to use the Site are animals, a few plant species also are included. It should be noted that these species are designated as special-concern because of their rarity. Observations of rare species are inherently sporadic and infrequent; consequently, many of these species may not be observed at the Site every year. Lack of observations of special-concern species at the Site in any given year is not considered cause for alarm; however, no observations of a species for several years in a row would trigger a more intensive search, particularly if no regional decline in the species has been reported.

Two threatened or endangered species use the Site seasonally. One federally proposed species is present at the Site. There are also several federal special-concern and Colorado Species of Special Concern. Table 3-14 presents the Site's 1997 search list for special-concern species. For further information on each of these species, refer to the previous sections on their specific groups (e.g., for peregrine falcons, refer to Section 3.1.5).

3.1.7.1 Threatened and Endangered Species

Listed threatened and endangered species observed at the Site during 1997 included the bald eagle (*Haliaeetus leucocephalus*) and the American peregrine falcon (*Falco peregrinus*). While these two species are not permanent residents at the Site, they do forage seasonally within the boundaries of the BZ. Bald eagles periodically make foraging flights over portions of the Site, and therefore may be observed over nearly any habitat (EG&G 1995a; RMRS 1996; K-H 1997d). One bald eagle was recorded onsite in the winter of 1997 (Table 3-9). Peregrine falcons have nested in the Flatirons a few miles northwest of the Site for several years (EG&G 1995b). A single fortuitous observation of an American peregrine falcon was recorded at the Site during 1997. This individual was a juvenile observed in flight over xeric mixed grassland. Previous habitat use by falcons at the Site has also included areas surrounding impoundments (DOE 1992; EG&G 1995a; RMRS 1996; K-H 1997d).

These species are of concern at the Site because of their protected status under the ESA. Site activities must be planned such that no take (harassment or harm) of these species occurs during the time they are present within Site boundaries.

3.1.7.2 Newly Listed Threatened Species

The Preble's meadow jumping mouse (*Zapus hudsonius preblei*), was officially listed as a threatened species in the May 13, 1998 Federal Register (1998). A specific Preble's mouse monitoring effort performed at the Site in 1997 is summarized briefly below. Complete results are found in Appendix C.

Monitoring in 1997 confirmed that Preble's mice were still present in Woman Creek and Walnut Creek, where they have been captured in the past, with the exception of the area of Walnut Creek below Pond B-4. No trapping was done in Rock Creek or Smart Ditch, because these locations were not included in the 1997 monitoring rotation schedule that has been established for the four main drainages. Figure 3-7 shows locations where Preble's mice were captured in 1997.

The Pond B-4 population had the highest calculated densities in 1995 (K-H 1996a), but after 1,100 trap-nights in 1997, no Preble's mice were captured. However, trapping in this area was conducted to determine the beginning of the active season, which is a sub-optimal time for detecting Preble's mice. In addition, no habitat has been altered since Preble's mice were last captured in this area. Therefore, it would be premature to assume that the population has been lost. Further trapping during the optimal activity period in 1998 is planned.

Woman Creek was more intensively trapped in 1997 than Walnut Creek. Compared with past efforts, results from Woman Creek indicate an increase in the mouse population. In 1992, Stoecker captured two Preble's mice in Woman Creek. In 1993, after 850 trap-nights, Stoecker captured seven Preble's mice (including recaptures) in Woman Creek (EG&G 1993). This equates to a relative abundance of 0.25 mice per 100 trap nights. In 1994 and 1995, less intensive trapping efforts were made in Woman Creek, and only one individual was captured during these two years (DOE 1995; K-H 1996a). Trapping efforts in 1996 (1,032 trap-nights) produced two individuals, including an adult female and a juvenile male, in a new area of Woman Creek (K-H 1996b). In 1996, the relative abundance of Preble's mice in Woman creek was 0.19 mice per 100 trap nights. Differences in trapping success from year to year are probably due, in part, to better knowledge of the mouse's preferred habitat, and to trapping efforts designed to target those areas.

The trapping strategies during past years have all been different and have yielded estimates of Preble's mouse relative abundance from 0.25 mice per 100 trap nights in 1993 to 0.37 mice per 100 trap nights in 1997, or 1.8% of the total number of small mammals captured during 1997. For comparison, deer mice (*Peromyscus maniculatis*) made up 64.5% of all captures, and meadow voles (*Microtus pennsylvanicus*) made up 23.1% of all captures. Results from 1997 suggest a wider distribution, and perhaps a higher population level, of Preble's mice than previously indicated.

The 1997 trapping effort documented movements of two marked individuals (one male and one female), of 3/4 mile (1.2 km) or more each. This was the first time that movements of this distance were recorded for individual Preble's mice, and previous to this finding, such a range of movement had not been suspected. This range of movement indicates that at least some individuals within the Woman Creek population may travel moderate distances to different areas within a creek drainage, either during a single season or from season to season. The implications of this observation have caused Preble's mouse researchers to reexamine the current theories about how the species is distributed throughout its habitat, and dispersal distances.

The habitat characterization results provided additional confidence in describing Preble's mouse habitat in Woman Creek by supporting past findings and providing better descriptions of seldom (or never) used habitats. The habitat characterization approach was changed in 1997 to classify an entire transect as "successful" if at least one Preble's mouse was captured. Successful transects contained significantly higher herbaceous density, tree/shrub canopy cover, and woody cover index values than unsuccessful transects, which would indicate a preference of the Preble's mouse for streamside areas that have thicker, more extensive vegetation cover. Woody species foliar cover measurements revealed that, while successful transects had nearly four times the foliar cover of coyote willow than unsuccessful transects, leadplant amounts were essentially the same at both. These results continue to support the hypothesis that coyote willow is an "indicator" of potential Preble's mouse habitat at the Site.

3.1.7.3 Federal Special-Concern Species

Federal special-concern species observed during 1997 included the eastern short horned lizard, the loggerhead shrike (*Lanius ludovicianus*), and the western burrowing owl (*Athene cunicularia hypugea*).

An eastern short horned lizard, a year-round resident species, was recorded as a fortuitous observation in xeric tallgrass prairie (Table 3-11). Xeric mixed grassland is apparently the preferred habitat for the species at the Site (DOE 1992; EG&G 1995a; RMRS 1996; K-H 1997d).

In a typical year, there are normally a few scattered observations of loggerhead shrikes. One loggerhead shrike was observed in tall upland shrubland during a multi-species census survey (Table 3-16 below). Five other fortuitous observations of the species were made in mesic and xeric mixed grasslands and riparian woodland.

A migrating burrowing owl (a species listed as State threatened in May 1998) was recorded at the edge of a dirt road in xeric tallgrass prairie as a fortuitous observation. Since 1993, occasional individuals of this species have been recorded on the Site during the spring migration period.

3.1.7.4 Colorado Species of Special Concern

Colorado Species of Special Concern using the Site during 1997 included northern leopard frog (*Rana pipiens*) and the American white pelican (*Pelecanus erythrorhynchos*). Several northern leopard frogs were found in association with open water, mudflats, and grasslands adjacent to water across the Site during 1997. American white pelicans were observed in open-water habitat during a multi-species census survey. With the larger reservoirs (Standley and Great Western) in the vicinity of the Site, pelicans are not frequent visitors to the Site's impoundments, but some have been observed each year. They do not nest at the Site, but do forage occasionally.

3.1.7.5 Watch-Listed Species

Watch-listed species observed at the Site during 1997 included such raptors as the long-eared owl (*Asio otus*), the Swainson's hawk (*Buteo swainsoni*), the northern harrier (*Circus cyaneus*), the Cooper's hawk (*Accipiter cooperii*), the prairie falcon (*Falco mexicanus*), and the golden eagle (*Aquila chrysaetos*) (Tables 3-9 and 3-10). Songbirds on the list of watch-listed species included the lark bunting (*Calamospiza melanocorys*) and the grasshopper sparrow (*Ammodramus savannarum*) (Table 3-16).

Northern harriers were observed over marshes, grasslands, and shrublands (nine fortuitous observations, two on sitewide surveys, and one on a multi-species survey). This species is more common in fall and winter than in the other seasons. A Cooper's hawk was recorded on a multi-species survey in riparian woodland. Golden eagles were observed largely in association with xeric and mesic mixed grassland. This species was observed most frequently soaring over or perched in grasslands, either hunting or resting (five fortuitous observations and three on sitewide surveys). Prairie falcons observed during multi-species surveys (two) were hunting birds along riparian woodland and in grasslands, and Swainson's hawks were most commonly found in association with either riparian woodland (roosting and nesting), or grasslands and wetlands (foraging). A total of 30 Swainson's hawk observations were divided among multi-species surveys (11), sitewide surveys (11), and fortuitous observations (8). Two long-eared owls were recorded in riparian woodland during bird surveys and multi-species surveys. Grasshopper sparrows were common in the wet meadow and xeric grasslands at the Site. Observations of lark buntings, previously very uncommon at the Site, were made in woodlands, shrublands, and grasslands. These observations included several flocks during spring and summer.

3.2 MIGRATORY BIRDS

The list of bird species that have been confirmed or are suspected of breeding at the Site includes 73 species. Confirmed breeding species are those species that have been observed building nests, tending eggs, or tending young, or for which young, flightless nestlings have been observed. Suspected breeding species are those that have been observed carrying nesting material, food, or other such indicators of breeding activity without actual visual confirmation of the presence of a nest or young. Among the 100 species of neo-tropical migrants known to use the Site, 45 are confirmed or suspected breeders at the Site.

Relative abundance of all bird species using the Site since 1991 is categorized in Table 3-15. This table is based on observed bird distribution by habitat during migratory bird surveys, multi-species census surveys, sitewide surveys, project-specific surveys, and fortuitous observations. This summary table shows a running tally of species recorded at the Site since 1991, and presents relative abundance categories (e.g., abundant, common, rare, etc.) in appropriate habitats for each species. The table does not estimate total

population numbers of each species inhabiting the Site. Note that some species are very habitat specific, while others are ubiquitous.

Evaluation of habitat use by birds, as indicated by data from cumulative combined records for all observation methods since 1991, yields different total species numbers for the different habitats than the species richness data from bird surveys alone (discussed below in Section 3.2.2). Based on all combined data, there are 188 bird species that use the Site at some time during the year. Bird species richness in the major habitats at the Site is 93 species in grasslands, 87 species in tall upland shrubland, 80 species in riparian shrubland, 112 species in riparian woodland complex, 114 species in wetlands, and 51 species in disturbed habitats (Table 3-15). Seasonal use also varies, with the largest numbers of species observed during spring and fall (139 and 117 respectively), highest richness in summer (113), and lowest richness in winter (56).

3.2.1 Bird Relative Abundance from Multi-Species Census Surveys

Assessment of relative abundance is a means of determining relative numbers of species within various habitats. The 1997 multi-species survey results for migratory birds (exclusive of waterfowl and raptors, which were discussed in previous sections) were analyzed for relative abundance of species within specified habitats by season. Comparisons made in the following sections are based on relative abundance of species within habitats and sitewide. Table 3-16 presents seasonal summaries of the migratory birds observed during multi-species census surveys. Table 3-17 shows seasonal and annual summaries of bird relative abundance sitewide. Comparisons of results based on numbers observed per unit time in a given habitat are presented in Appendix D.

As shown on Table 3-17, House finches are the most abundant migratory bird across the Site year round (0.2109 observations per minute of observation [o/m]). European starlings are also strongly abundant most of the year, with an annual abundance of 0.1026 o/m. Such abundance of this Eurasian invader is of concern since this species impacts many of the declining neotropical migrants that are commonly known to be declining in numbers across their entire range. Several other species are also quite abundant at the Site, largely on a seasonal basis. These species include the red-winged blackbird (0.1707 o/m), western meadowlark (0.1287 o/m), cliff swallow (0.1125 o/m), and vesper sparrow (0.0898 o/m). Note that several of these species are extremely abundant in spring and summer, and not present during fall and winter.

3.2.1.1 Winter

Fourteen bird species were observed sitewide during winter multi-species surveys. Some are winter residents, some are early migrants, and the remainder are year-round residents. Most species observed during winter were seen predominantly in woodlands and shrublands. The notable exception was the horned lark (*Eremophila alpestris*), with a relative abundance of 0.025 o/m, of which 82% were in xeric mixed grassland. The most common winter species during 1997 was the European starling (*Sturnus vulgaris*) (relative

abundance = 0.138 o/m). While this species was observed in a variety of habitats, the great majority of observations were in riparian shrubland and woodland (96%). Another species found predominantly on riparian woodland and shrubland was the American tree sparrow (*Spizella arborea*) (relative abundance = 0.049 o/m), of which 91% of observations were in these habitats. Song sparrows (*Melospiza melodia*) also favored these habitats (sitewide relative abundance of 0.007 o/m), with 40% observed in riparian woodland/shrubland, and 25% in tall upland shrubland. Black-billed magpies (*Pica pica*) (relative abundance = 0.040 o/m) divide their time equally between riparian woodland and tall upland shrubland (48% and 41%, respectively). Northern flickers (*Colaptes auratus*) (0.018 o/m) preferred riparian woodland (80%), and American robins (*Turdus migratorius*) (0.040 o/m) preferred tall upland shrubland (89%). For habitat use and species abundance of other species, refer to Tables 3-16 and 3-17.

3.2.1.2 Spring

Sitewide species richness increased greatly in the spring (42 species), and the habitat use also became more diverse (Table 3-16). A number of the migratory species became abundant or common as the season advanced. The most abundant species were the red-winged blackbird (*Agelaius phoeniceus*) (0.172 o/m), house finch (*Carpodacus mexicanus*) (0.076 o/m), cliff swallow (*Hirundo pyrrhonota*) (0.264 o/m), western meadowlark (*Sturnella neglecta*) (0.151 o/m), and European starling (0.078 o/m). These species were followed in abundance by the barn swallow (*Hirundo rustica*) (0.053 o/m), song sparrow (0.062 o/m), vesper sparrow (*Pooecetes gramineus*) (0.048 o/m), American goldfinch (*Carduelis tristis*) (0.044 o/m), American robin (0.033 o/m), and mourning dove (*Zenaida macroura*) (0.032 o/m). Other species varied in abundance from 0.025 to 0.001 o/m. For habitat use and species abundance of other species, refer to Tables 3-16 and 3-17.

Habitat preferences for the various species corresponded to the niches filled by these species. American goldfinches and house finches were most commonly found in riparian woodland/shrubland (66% and 58%, respectively), or for goldfinches, tall upland shrubland (25%). Swallow species were most often observed around wetlands and ponds (53% for cliff swallows and 83% for barn swallows) or perched on powerlines over roads. Red-winged blackbirds typically preferred marshlands (33%) and riparian areas (26%). Northern orioles (*Icterus glabula*) used riparian woodland heavily (79%). Song sparrows divided their time among riparian woodland (41%), tall marsh (21%), and tall upland shrubland (28%). Black-billed magpies shifted their allegiance somewhat more to riparian woodland (51%) than to tall upland shrubland (30%) in the spring, possibly reflecting nesting opportunities. Vesper sparrows were observed more often in grasslands (53%) than in other habitats. Western meadowlarks divided their time between grasslands (48%) and riparian woodland (40%), probably because of the abundant perch-points offered by woodlands. European starlings, as in other seasons, preferred riparian woodlands (69%), and mourning doves spent most of their days in the woody vegetation of riparian and tall upland shrubland communities (84%).

3.2.1.3 Summer

Summer showed the greatest species richness within the multi-species surveys, with 48 species recorded (Table 3-16). Species with the greatest recorded abundance were the house finch (0.610 o/m), red-winged blackbird (0.447 o/m), the vesper sparrow (0.235 o/m), western meadowlark (0.203 o/m), European starling (0.163 o/m), American goldfinch (0.126 o/m), cliff swallow (0.123 o/m), and barn swallow (0.106 o/m). Other species of note were the rufous-sided towhee (*Pipilo erythrophthalmus*) (0.072 o/m), mourning dove (*Zenaida macroura*) (0.071 o/m), song sparrow (0.069 o/m), Brewer's blackbird (*Euphagus cyanocephalus*) (0.065 o/m), northern oriole (0.046 o/m), grasshopper sparrows (*Ammodramus savannarum*) (0.040 o/m), and blue grosbeak (*Guiraca caerulea*) (0.029 o/m). For habitat use and species abundance of other species, refer to Tables 3-16 and 3-17.

Red-winged blackbirds prefer marshlands, so it was not surprising that 81% of red-winged blackbird observations occurred in wetlands. Grasshopper sparrows preferred xeric mixed grassland in 50% of observations. American goldfinches preferred riparian woodland (53%) and tall upland shrubland (34%). Swallows changed habitat affinity to riparian woodland/shrubland habitats in summer. Cliff swallows used these habitats more heavily (74%) than barn swallows (42%). This shift probably reflects the resting/feeding habitat required by juveniles of both species. Song sparrows spent the majority of their time in woody habitat as well, with 42% of observations in riparian woodland and 31% in tall upland shrubland. Rufous-sided towhees were observed almost exclusively in tall upland shrubland (99%). As in other seasons, black-billed magpies divided most of their time between riparian woodland/shrubland (43%) and tall upland shrubland (52%). Vesper sparrows (47%) and western meadowlarks (88%) favored grasslands. As in other seasons, European starlings were most frequently observed in riparian woodland (82%). During the summer, American robins continued to show their affinity to woody habitats (29% riparian and 62% tall upland shrubland).

3.2.1.4 Fall

Fall of 1997 found 31 species recorded during the multi-species surveys (Tables 3-16 and 3-17). The most abundant species changed somewhat, with western meadowlark most abundant (0.133 o/m), followed by house finches (0.129 o/m), black-billed magpies (0.068 o/m), vesper sparrows (0.063 o/m), and song sparrows (0.057 o/m). For habitat use and species abundance of other species, refer to Tables 3-16 and 3-17.

Habitat preferences remained similar to other seasons, with house finches, black-billed magpies, and song sparrows preferring woody habitats (80%, 91%, and 70%, respectively). Vesper sparrows were divided among grasslands (23%), wetlands (32%), and woody habitats (36%). Western meadowlarks were observed more often in woody habitats (38%) than grasslands (25%). The affinity of European starlings for riparian woodland remained consistent (98%). Three migratory species became evident in the fall: the American tree sparrow, white crowned sparrow (*Zonotrichia leucocephalus*), and clay-colored sparrow (*Zonotrichia querula*). These three species were found

predominantly in woody habitats (84%, 84%, and 88%, respectively). Many of the abundant summer species had become scarce or absent.

3.2.2 Migratory Bird Survey Summaries

Several years of migratory bird survey data, from surveys performed along 20 permanent transects at the Site, were evaluated for trends in species richness (number of species) by habitat and bird densities (individuals per hectare) for each of seven habitats. Species richness and density were summarized by season. Data collected during 1997 were compared to six years of previously reported data (DOE 1992; EG&G 1994; EG&G 1995a; RMRS 1996) to examine trends in these parameters. Discussions below include analyses of data from breeding season, winter season, and migration season (spring and fall).

During 1997, 84 bird species were recorded on migratory bird surveys alone. Fifty of these species (60%) were neo-tropical migrants. This large percentage of neo-tropical migrants using the Site demonstrates the importance of the habitats provided by the Site to this sensitive group of bird species.

3.2.2.1 Bird Diversity and Species Richness

The Simpson's diversity index (D') is used as a means of comparing among habitats and from year to year. The index takes into account both the number of species present and the relative abundance of those species. Generally speaking, more species in greater abundance will raise the value of the index. However, the index emphasizes the even distribution of abundance across species, so observations of bird species that forage in flocks in the same habitat with solitary species will have the effect of lowering the index for that habitat. No diversity index should be treated as a value judgment. Higher diversity is not always "better" (the addition of non-native species is an example). The following discussions of seasonal bird diversity are based on data collected during migratory bird surveys.

Diversity indices reflect the number of available niches in the different habitats. A woody habitat provides more niches within its three-dimensional, multi-strata environment than does a grassland. And a grassland with greater vegetative species diversity (native xeric and mesic grassland) provides more niche opportunities than the near monoculture of a reclaimed grassland. Therefore, the apparent correlation of species diversity to habitat type is expected, as discussed below.

Breeding Bird Diversity in June— The breeding season diversity indices for the Site for all habitats combined over the past six sample years (1991, 1993–1997) show a slight upward trend (Table 3-18). Most habitats within the Site show either a similar upward trend or a steady track (reclaimed grasslands). The only exception is wetlands, which show a steady decline in diversity over time ($D' = 0.70$ in 1991 to $D' = 0.62$ in 1997). Figure 3-8 graphically depicts June bird species diversity by habitat for all years.

The site habitats with the greatest diversity are the woody habitats, such as riparian woodlands, lead plant (*Amorpha fruticosa*) riparian shrublands, and tall upland shrubs (Figure 3-8). The grasslands generally support the least diversity.

Species richness across all habitats during the breeding season (Table 3-19) shows a slight increase over time (45 in 1991 to 49 in 1997) (Figure 3-9). Breeding bird assemblages show the greatest species diversity in riparian woodland and tall upland shrubland habitats. These two habitats have the greatest annual maxima and averages of species richness (as indicated by bird surveys) of all the habitats surveyed. Riparian woodland, tall upland shrubland, and mesic grassland reflect an upward trend in species richness during the breeding season (Appendix E), while xeric and reclaimed grasslands remain steady (Appendix E).

While wetlands and *Amorpha* riparian shrublands (Appendix E) show a slight decrease over time during the breeding season, the majority of the "missing" species were present on the Site, but were not recorded in that habitat. After a review of data from other surveys, those species found to be absent in 1997 included the savannah sparrow (*Passerculus sandwichensis*), the marsh wren (*Cistothorus palustris*), and the black-crowned night heron (*Nycticorax nycticorax*). It is interesting to note, however, that as of this writing in May 1998, the marsh wren and savannah sparrow have been recorded in wetlands at the Site. With the rarer species, it is not unusual to miss recording the species for a few years, then to rediscover it.

A noteworthy contrast to the slight overall increase in species richness during the breeding season is the decline of neotropical migratory birds across all habitats (Figure 3-10). This group of birds is characterized by migratory species that travel to Central and South America to overwinter and return to breed in North America. This downward trend of neotropical migrants warrants further monitoring, but probably reflects the well-documented regional decline of this group.

Bird Diversity and Species Richness During Migration Seasons—In the spring of 1997, the woody habitats (riparian woodland, tall upland shrubland, and *Amorpha* riparian shrubland) had the highest species diversity ($D' = 0.95, 0.93, \text{ and } 0.90$, respectively), while the reclaimed grassland had the lowest ($D' = 0.73$). This relation did not hold true during the previous three years, but the woody habitats varied least in species diversity from year to year (standard deviation [s] = 0.01, 0.01, and 0.02 for riparian woodland, tall upland shrubland, and *Amorpha* riparian shrubland, respectively), while reclaimed grassland had the greatest variability ($s = 0.05$). Figure 3-11 shows spring species diversity over all habitats.

In the fall of 1997, the woody habitats again had the highest species diversity, with $D' = 0.91$ for riparian woodland, 0.90 for tall upland shrubland, and 0.91 for *Amorpha* riparian shrubland. In the fall, the mesic grassland had the lowest diversity, with $D' = 0.65$. Figure 3-12 shows spring species diversity over all habitats.

The riparian woodland had the highest number of species in 1997 in both the spring and fall (36 and 21 species, respectively). Conversely, the reclaimed grassland had the lowest number of species in the spring and fall (8 and 7 respectively) (see Figures 3-13 and 3-14).

See Appendix F for a more detailed summary of diversity, species richness, and bird densities by habitat for each season.

Bird Species Richness in Winter—Species richness during the winter months (1991, 1993–1997) follows an upward trend, although species richness in winter is characterized by relatively low numbers as compared with summer (see Table 3-20). Typically, the winter assemblage of bird species changes from year to year. Analysis of winter populations is hampered, because low numbers of birds are observed in winter. Habitats that exhibit a change in assemblage from year to year include wetlands, *Amorpha* riparian shrubland, mesic mixed grasslands, reclaimed grasslands, and xeric mixed grasslands. Conversely, riparian woodlands typically are characterized in winter from year to year by American tree sparrows, great horned owls, and northern flickers. Typical winter residents in upland shrubs are black-billed magpies, and black-capped chickadees.

Riparian woodland, tall upland shrubland, and mesic grasslands exhibit an upward trend in species richness during the winter, while xeric and reclaimed grasslands and *Amorpha* riparian shrublands remain steady. The downward trend in wetlands observed during the breeding season continued in the winter. See Appendix G for a more detailed summary of diversity, species richness, and bird densities by habitat.

3.2.2.2 Bird Densities

Bird densities are calculated from data collected during migratory bird surveys only. All densities are presented as calculated birds/hectare (ha). The areas surveyed are belt transects of known area; therefore, these calculations are a direct correlation of numbers observed during the surveys.

Bird Densities in June (Breeding Season)—The overall bird density (all species combined) in June over the entire site shows a steady increase over time (bird surveys from 1991, 1993–1997). Table 3-21 shows a summary of 21 species selected as representative of the Site. Densities have increased from 5.30 birds/ha in 1991 to 10.03 birds/ha in 1997. Of particular interest is the large increase in overall densities between 1996 (7.86 birds/ha) and 1997 (10.03 birds/ha).

Overall bird densities by habitat in the month of June for all years are compared in Table 3-22. All habitats but one show at least a slight increase over time. Reclaimed grasslands show a slight decrease over time.

Several species from each of the seven major habitat types were selected to represent the trends in bird densities (individuals per hectare) during analyses of these species groups over time (see Table 3-21). Species were selected based on their overall abundance in each habitat type and/or their uniqueness to a particular habitat (indicator species). Trends of undesirable species, specifically the European starling (an alien species that out-competes native cavity-nesting birds for nest locations) and the brown-headed cowbird (a parasitic species), are also described for appropriate habitats.

In reviewing the 21 selected species across all habitats on the Site, 18 species show at least a small increase over time. The European starling and the brown-headed cowbird (less desirable species), and the black-billed magpie and rufous-sided towhee, show substantial increases, especially over the 1997 breeding season. Three species: Brewer's blackbird, common snipe (*Gallinago gallinago*), and western kingbird (*Tyrannus verticalis*) show downward trends over time. It should be noted, however, that 98 Brewer's blackbirds, 50 common snipe, and 6 western kingbirds were observed during summer 1997 multi-species surveys, so these species were not absent during the breeding season.

The red-winged blackbird, song sparrow, common yellowthroat (*Geothlypis trichas*), and common snipe represent wetlands. The overall trend in abundance of these species in wetland areas is increasing (Table 3-23), with one exception: the common snipe densities indicate a downward trend.

The house finch, European starling, northern oriole, American goldfinch, yellow warbler, brown-headed cowbird, and blue grosbeak represent riparian woodland habitat. Overall density trends of this group are increasing (Table 3-23), again with one exception: the yellow warbler (*Dendroica petechia*), a neotropical migrant, shows a decline in density over time. Of special note, the undesirable European starlings and brown-headed cowbirds show an increasing trend in riparian woodland areas.

The vesper sparrow, mourning dove, European starling, northern oriole, and Brewer's blackbird represent *Amorpha* riparian shrubland habitat. The overall trends of these selected species vary (Table 3-23), with densities of starlings increasing slightly, densities of vesper sparrows and orioles staying steady, and densities of mourning doves and Brewer's blackbirds declining.

Tall upland shrubland habitat is represented by song sparrows, rufous-sided towhees, brown-headed cowbirds, black-billed magpies, yellow-breasted chats, and black-capped chickadees (*Parus atricapillus*). The overall densities for these species are increasing in this habitat, though only slightly for yellow-breasted chats. One interesting note is the recent appearance of black-capped chickadees in this habitat. During the first two years, no chickadees were observed, but the species has since appeared, increased in abundance, and expanded into riparian woodland habitat.

The vesper sparrow, house finch, western meadowlark, western kingbird and grasshopper sparrow represent mesic mixed grasslands. The densities of meadowlarks are increasing, whereas vesper sparrows, house finches, and grasshopper sparrows are steady. Western kingbird densities are declining slightly.

The vesper sparrow, western meadowlark, and grasshopper sparrow represent xeric mixed grasslands. These selected species are all showing an increase in density over time. Also, there is a general trend of grasshopper sparrows increasing in grassland habitats across the site.

The western meadowlark, vesper sparrow, and grasshopper sparrow represent reclaimed grasslands. The overall trends for these selected species vary. Western meadowlark densities are decreasing, vesper sparrows show a steady abundance, and the density of grasshopper sparrows is increasing.

Bird Densities During Migration Season — Densities of migrating birds are variable, and species use from year to year can be sporadic. Because of this variability, only the analyses of selected species are presented in this discussion. The species discussed below are special-concern species and undesirable species. It should be noted that all estimates of numbers of individuals over the four years analyzed (1994–1997) should be used for comparison purposes only. These are not intended to be population estimates.

Special-concern species occur sporadically from year to year, spring to fall, and within different habitats. The grasshopper sparrow, a representative special-concern species, is a prairie species and, accordingly, was found most consistently in the mesic, reclaimed, and xeric grassland communities. These three grasslands cover 1,966 hectares (ha) (4,856 acres), about 75% of the Site. The Site is on an edge of the species' summer breeding range, which extends across the Great Plains to the Rocky Mountains.

The grasshopper sparrow is present in higher densities in the spring than in the fall, with an average of 0.053 birds/ha over the four years (1994–1997). Raptors, a group that includes several special-concern species, have maintained a consistent sitewide density in the spring of 0.04–0.05 birds/ha from 1994 through 1997. Fall densities are more variable, and show a net decrease from 0.07 birds/ha in 1994 to 0.04 birds/ha in 1997. This decrease probably reflects the reduced number of prairie dogs in the vicinity of the Site since 1994. With a reduced prey base, raptors often seek better hunting elsewhere.

European starlings are considered a nuisance species, because they are an invasive exotic species that out-competes native cavity-nesting birds. European starlings are found in all habitats on the Site. The highest densities of starlings in both the spring and fall are found in the riparian woodland/shrubland habitats, which naturally provide the highest density of nesting sites and food resources. Conversely, they are found least in the xeric and reclaimed grasslands.

European starlings have steadily increased in numbers each spring, from a sitewide density of 0.275 birds/ha in 1994 to 0.539 birds/ha in 1997. The most noticeable increase was in the *Amorpha* riparian shrubland habitat; from 1 bird/ha to 3 birds/ha. Fall densities are highly variable, showing markedly higher densities in 1995 (0.864 birds/ha) than 1996 (0.212 birds/ha), which is attributable to a drop in starling density in the riparian wood and shrubland habitats. Still, there was a net increase in sitewide densities from 1994 (0.080 birds/ha) to 1997 (0.234 birds/ha).

Bird Densities in Winter— Bird observations in winter vary, but are generally too sparse to yield valid density analyses. Songbirds may be observed in ones and twos along an entire transect, or may be observed in flocks of dozens or more. On the average, several transects a month during the winter will record no observations. While the variability may make statistical analyses difficult, this is the time that important observations of raptor species are often made.

4. CONCLUSIONS

The Site provides a unique refuge along the central Front Range for a large number of bird and mammal species. The presence of this refuge is due in large part to more than two decades of protection from grazing, development, and other disturbances that a major portion of the Site has enjoyed. The area enclosed by the 1950s BZ has experienced this singular habitat protection for more than 40 years. The exclusion of grazing and development has allowed the native prairie/montane ecotonal area in the BZ to rebound from its previously overgrazed state. The Site does, however, suffer from the influences of nearby development, adjacent industrial activities, and regional weed infestations. While wildlife movement corridors continue to remain open, providing more mobile species with the opportunity to enter and leave the Site at will, the Site is becoming more isolated from adjacent ecological communities each year. Unless careful management of the Site's natural resources continues, these outside influences will eventually degrade the current high quality of the Site.

Large-scale real estate development, mining, and water diversions on other large tracts of land along the Front Range have already destroyed or degraded much of the native habitat that was once available. It is due to the protection and isolation of the BZ that rare or imperiled species, and the current significant species diversity, are found at the Site (see Table 3-14 and Appendix A). A number of the species at the Site are sensitive species or indicator organisms that by their presence—or more significantly, by their absence—indicate the ecological health of an area.

At the end of the 1997 field season, 249 terrestrial vertebrate species had been verified as using the Site's ecosystems. This is an impressive diversity when compared to the 322 terrestrial vertebrate species found at Rocky Mountain National Park, an area 98% larger than the Site. The Site's diversity includes 188 species of birds (19 are raptors), 3 big game species, 11 species of carnivores, 3 lagomorphs, 6 large rodents, 22 small mammal species, 9 reptiles, and 7 amphibians recorded since 1991. No definitive inventory of arthropods and other invertebrates has been made. This high species diversity and continued use of the Site by numerous special-concern species verifies that habitat quality for these species has remained acceptable and that ecosystem functions are being maintained.

One of the goals of the *Integrated Monitoring Plan – Ecology* (K-H 1997e) is to make annual assessments of endpoints for wildlife populations at the Site. Monitoring performed under the NRCPP tracks the populations of wildlife species and indicates the ecological health of the Site as well as effects of nearby activities.

A healthy natural environment provides a wide variety of ecological niches. This ecological health is reflected in species richness and population dynamics. All wildlife species in an ecosystem require healthy, well-balanced habitats in which to live and

reproduce. Degraded habitat is reflected by lower numbers and reduced diversity of wildlife. The data collected during the 1997 field effort indicate that wildlife populations are stable and species richness remains high. Therefore, current Site activities are not having an adverse effect on BZ ecosystems.

The mule deer population remained stable at about 145 animals. Male-to-female and young-to-adult ratios are well within the constraints of what wildlife experts consider a healthy deer herd. Songbird density and diversity numbers indicate stability or slight increases in songbird use of all habitats at the Site. Completing an accurate census of migratory waterfowl, carnivores, and herptiles is more difficult, but these species continued to be observed in numbers similar to past years. The coyote population maintained several packs across the Site, and several natal dens were discovered. It is of interest, and perhaps an indication of pressure in surrounding areas, that a black bear was again observed at the Site in 1997. This normally shy, secretive species is unusual in predominantly prairie habitat, but the bear may have been displaced from surrounding habitat, but its appearance also illustrates the connectivity of the Site to the montane habitats to the west. The four raptor species that most commonly nest at the Site successfully reared young in 1997. The normal migratory assemblage of waterfowl visited the Site in the spring and fall of 1997, and the species that commonly breed at the Site were recorded with broods of young.

The long-term, year-round ecological monitoring program conducted under the NRCPP continues to be an essential tool for identifying, describing, and quantifying fluctuations of wildlife populations, wildlife habitat use, and changes in the species that use the Site as year-round or seasonal habitat. Wildlife population densities vary constantly with natural pressures, and only well-integrated, long-term monitoring such as this can identify consequences of natural causes versus consequences of human activities. The data produced are an invaluable tool in predicting and avoiding impacts on the ecology of an area resulting from projected human activities. If sensitive species dwindle in numbers or disappear, a serious environmental health problem is indicated. Monitoring and surveys such as those carried out by the NRCPP detect trends of this sort, and act as an "early warning system" for impending ecological problems. This function will become increasingly important as remediation activities at the Site increase, and will play an essential role when NRDA evaluations are made.

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Figures

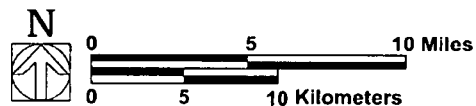
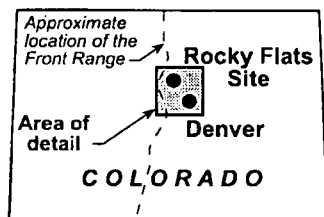
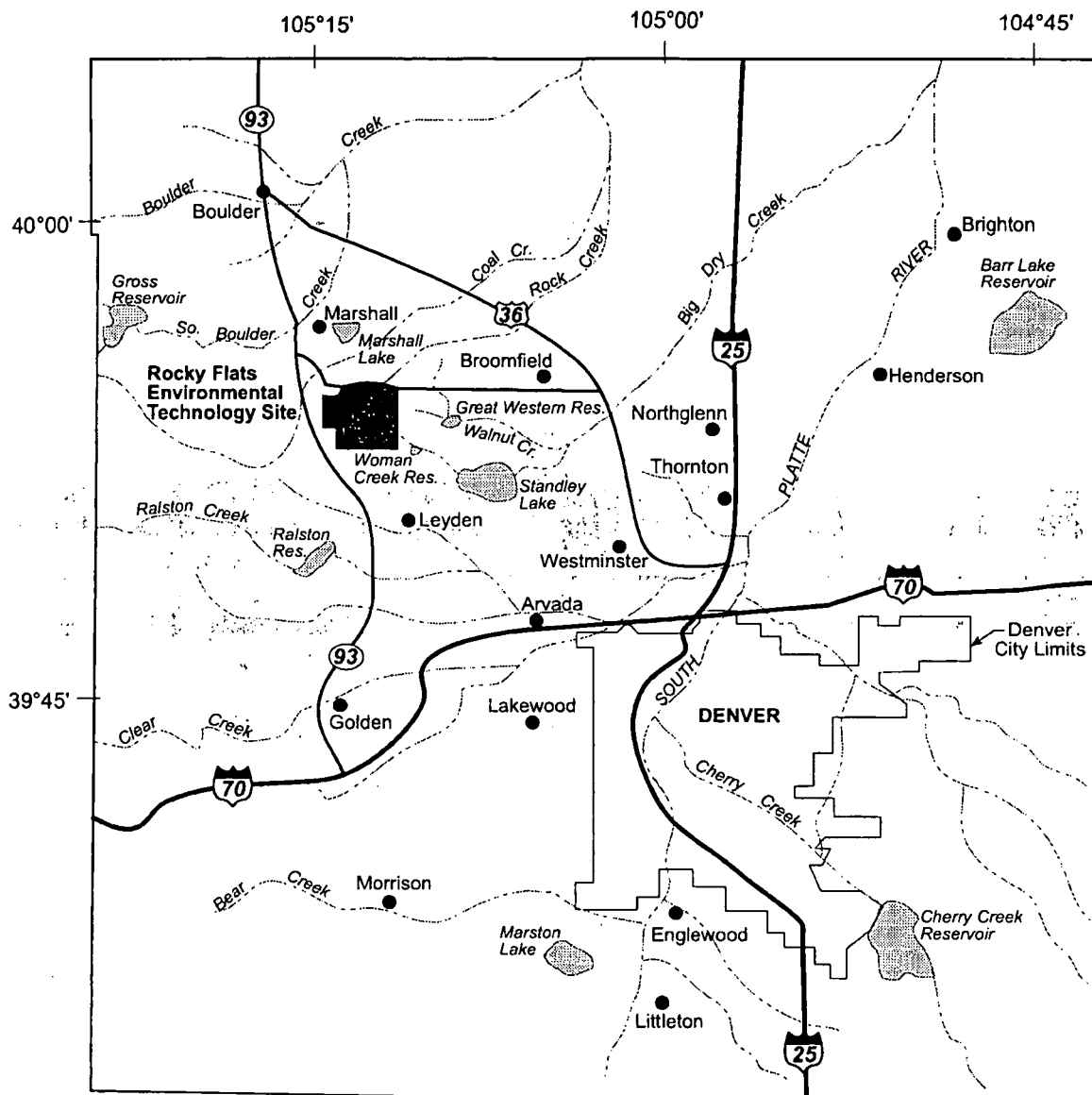
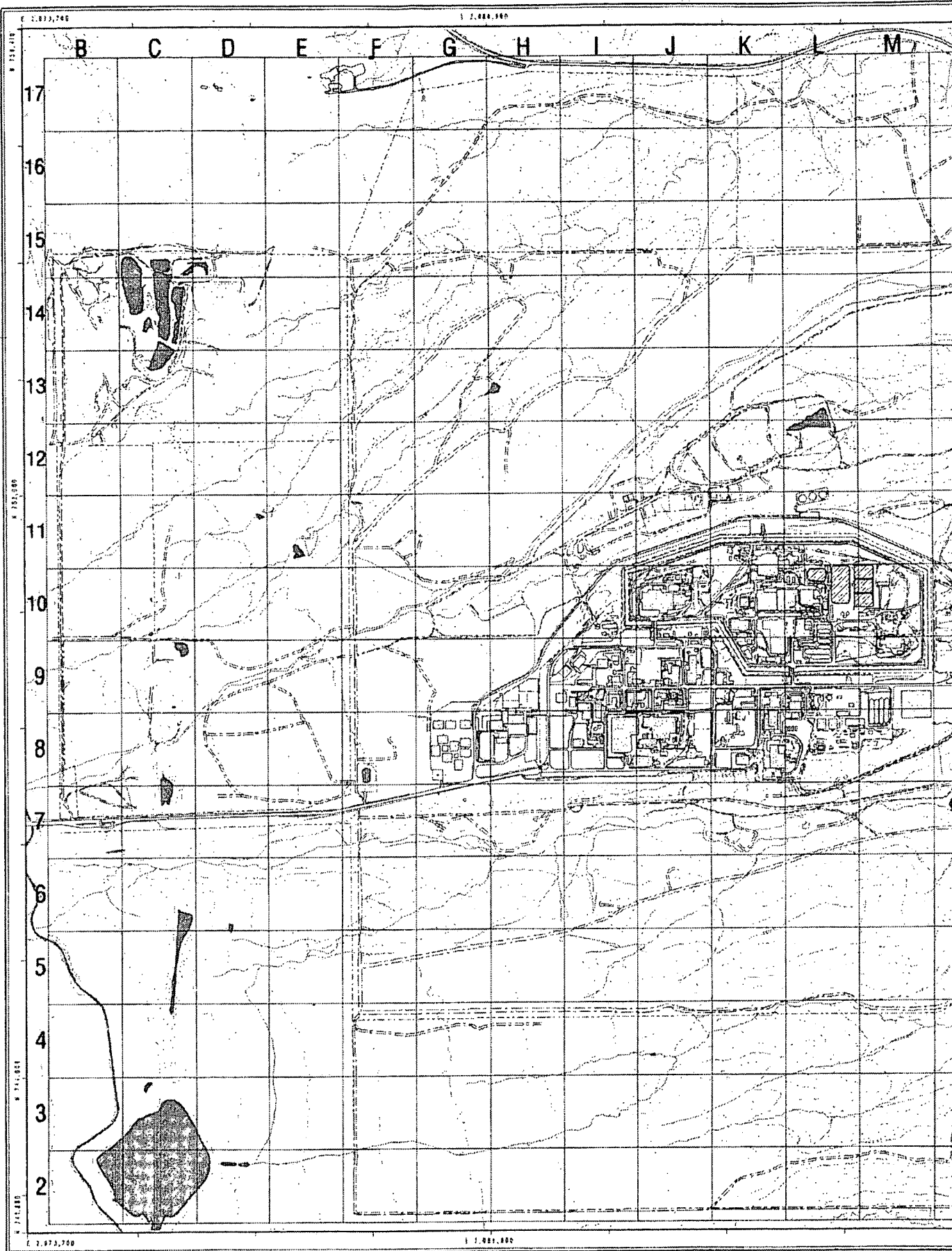
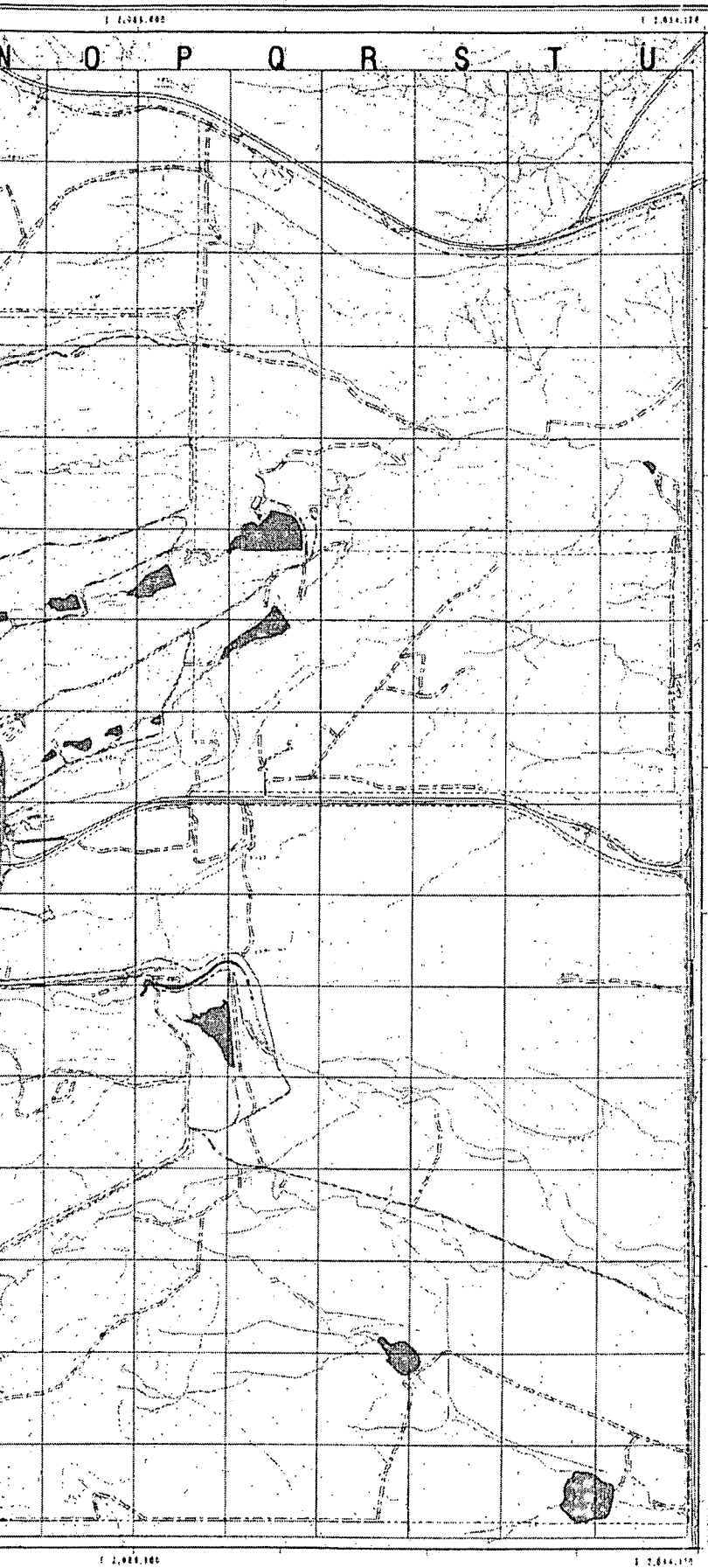


Figure 1-1. Location of the Rocky Flats Environmental Technology Site.





Grid map of Rocky Flats Environmental Technology Site used for location data entry

Figure 2-1.

MAP LEGEND

1,000 ft grid

Standard Map Features

Buildings and other structures

Solar evaporation ponds

Lakes and ponds

Streams, ditches, or other
drainage features

Fences and other barriers

Contour (20-Foot)

Paved roads

Dirt roads

DATA SOURCE:
Buildings, fences, hydrography, roads and other
structures from 1954 aerial fly-over data
captured by 24807 RSL, Las Vegas.
Digitized from the orthophotograph, 1/25.
Topography (contours) were derived from digital elevation model
(DEM) data by Morrison Knudsen (MK) using ESRI Arc 7.0 and
LATERAL to process the DEM data to create 5-foot contours.
The DEM data was captured by the Remote Sensing Lab, Las
Vegas, NV, 1994 Aerial Flyover at 10 meter resolution.
The DEM post-processing performed by MK, Winter 1997.



Scale = 1 : 21330
1 inch represents approximately 1778 feet

500 0 1000 2000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared
by:

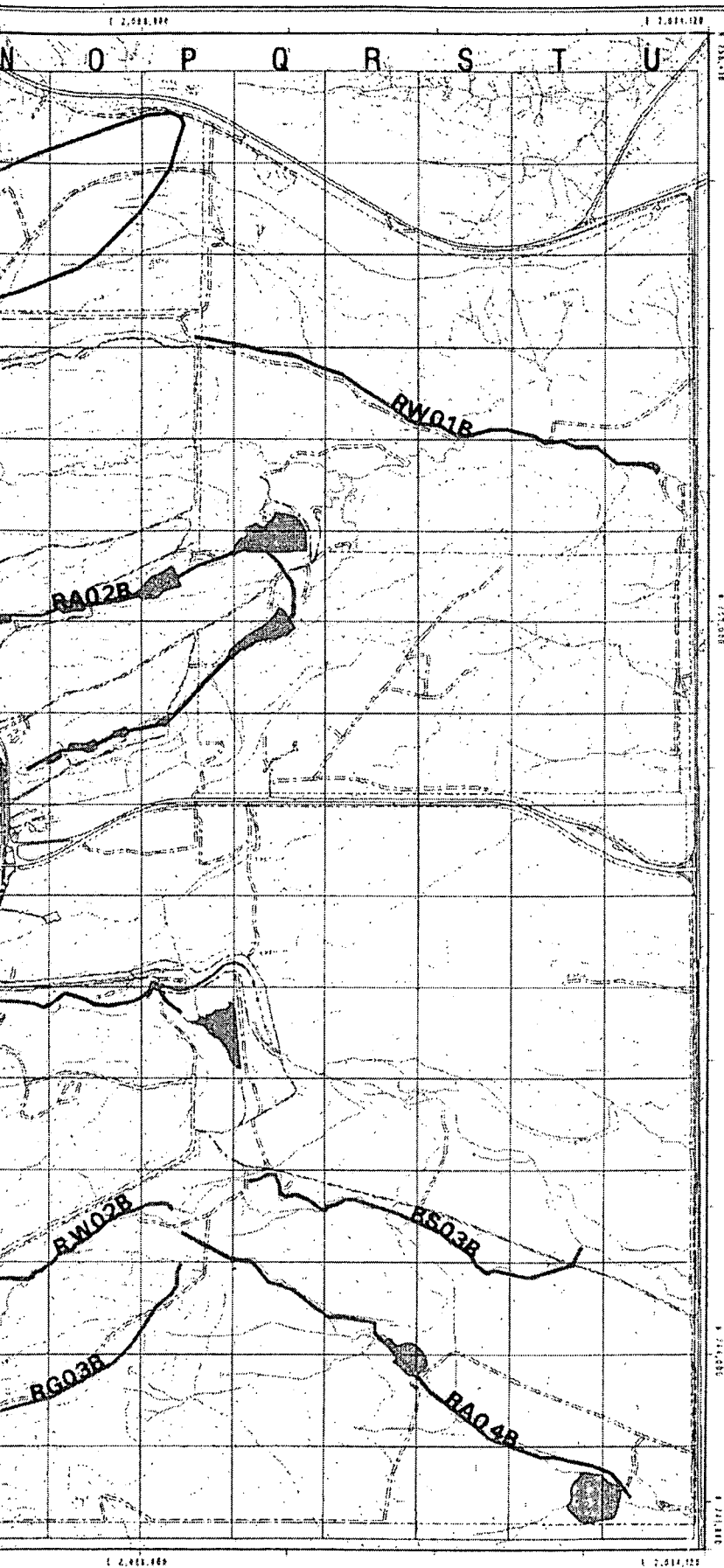
Exponent™

MAP ID: mmf08-007

May 06, 1998

from eh618651/ecology/arcgrid.aml





Locations of multi-species
census survey transects
Figure 2-2.

MAP LEGEND

Multi-species census transects

Standard Map Features

- Solar evaporation ponds
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Contour (20-Foot)
- Paved roads
- Dirt roads

DATA SOURCE:
Buildings, fences, hydrography, roads and other structures from 1996 aerial fly-over sets captured by EDA/RSI, Los Vegas. Digitized from the schenographic, USGS Topology (contours) were derived from digital elevation model (DEM) data by Meridian Computer (MEX) using TSP/AVE TM and LATICE to process the DEM data to create 5-foot contours. The DEM data was captured by the Remote Sensing Lab, Los Vegas, NV, RSNA Aerial Flyover at 1:50,000 resolution. The DEM post-processing performed by MEX, October 1997.

DISCLAIMER:
Transect routes are approximate and are not to scale.



Scale = 1 : 21330
1 inch represents approximately 1778 feet



State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

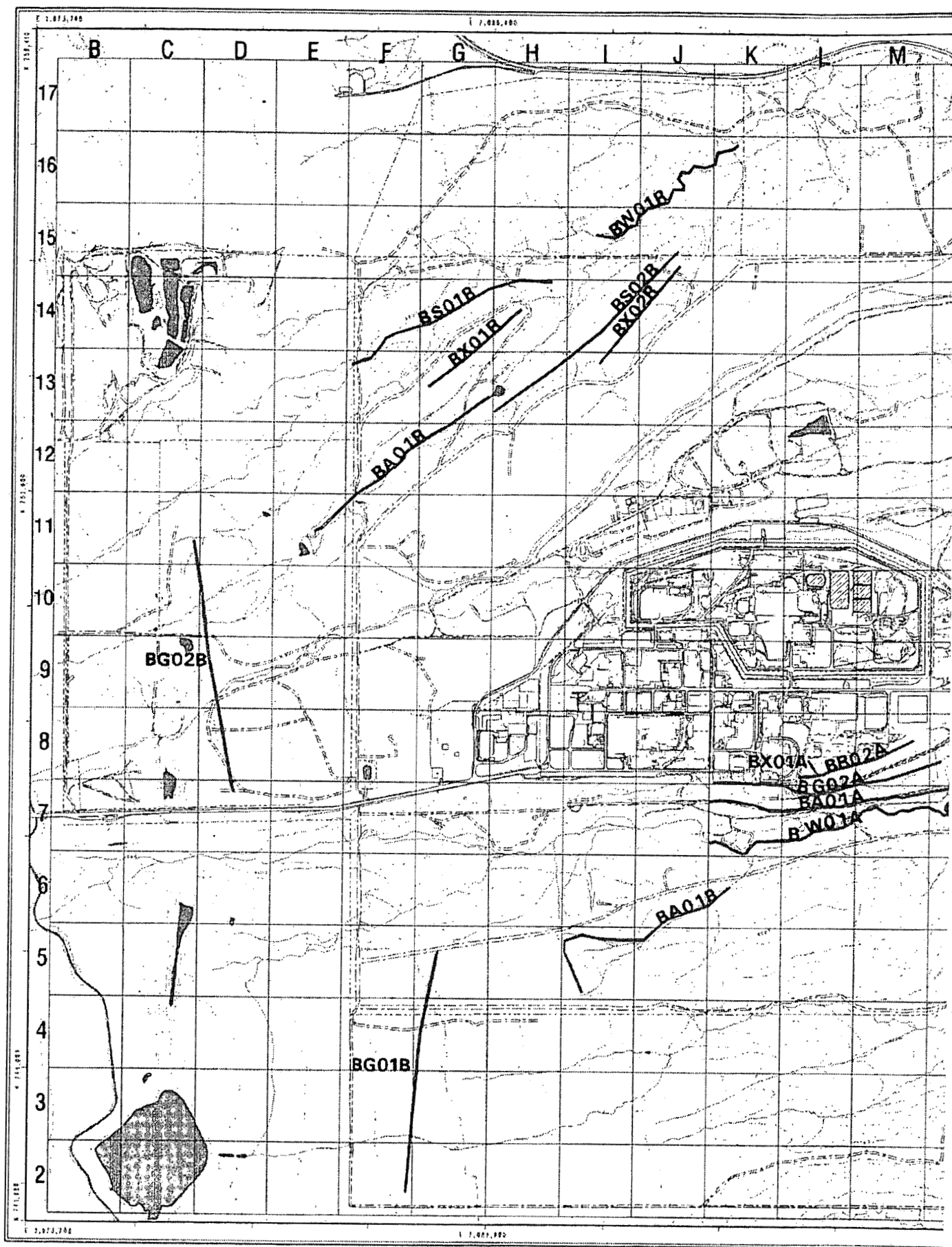
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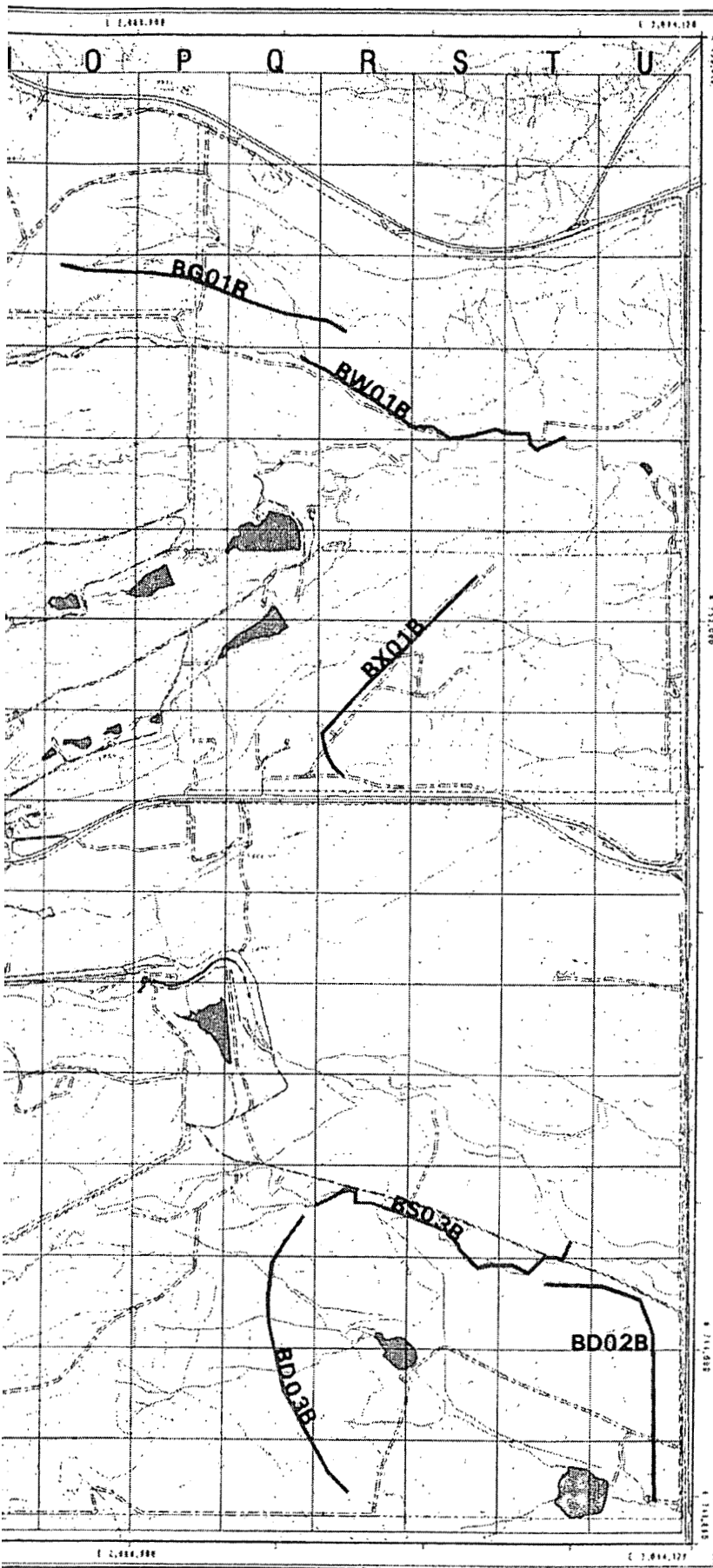
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May 06, 1998


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


Locations of bird survey transects
Figure 2-3.


MAP LEGEND

 Bird survey transects


Standard Map Features


 Solar evaporation ponds


 Lakes and ponds

 Streams, ditches, or other drainage features

 Fences and other barriers

 Contour (20-Foot)

 Paved roads

 Dirt roads

DATA SOURCE:

Buildings, fences, hydrography, roads and other structural features 1994 aerial fly-over data captured by EO 4.0 RES, Las Vegas. Digitized from the orthophotographs, 1/98. Topography (contours) were derived from digital elevation model (DEM) data by Microvision Systems (MS) using ESRI Arc 7.0 and LANTICE to process the DEM data to create 5 foot contours. The DEM data was captured by the Remote Sensing Lab, Las Vegas, NV, 1994 aerial fly-over at 1:10,000 scale. The DEM post processing performed by MK, Winter 1997.

DISCLAIMER:

Transect routes are approximate and are not to scale.



Scale = 1 : 21330
1 inch represents approximately 1778 feet



State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared by:

ExponentTM

MAP ID: mmf98-005

May 06, 1998

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Figure 3-1. Total Number of Mule Deer in Winter

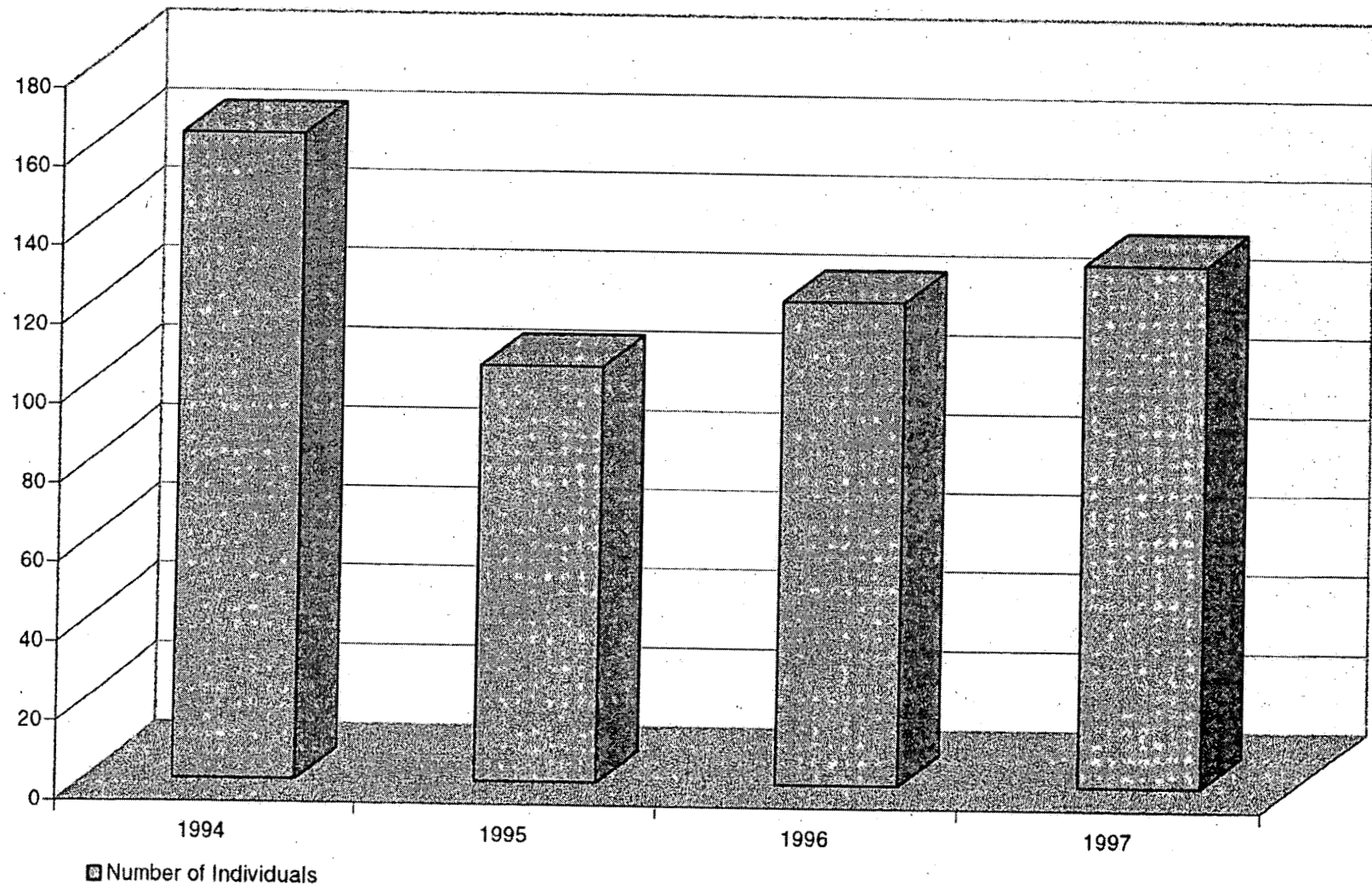
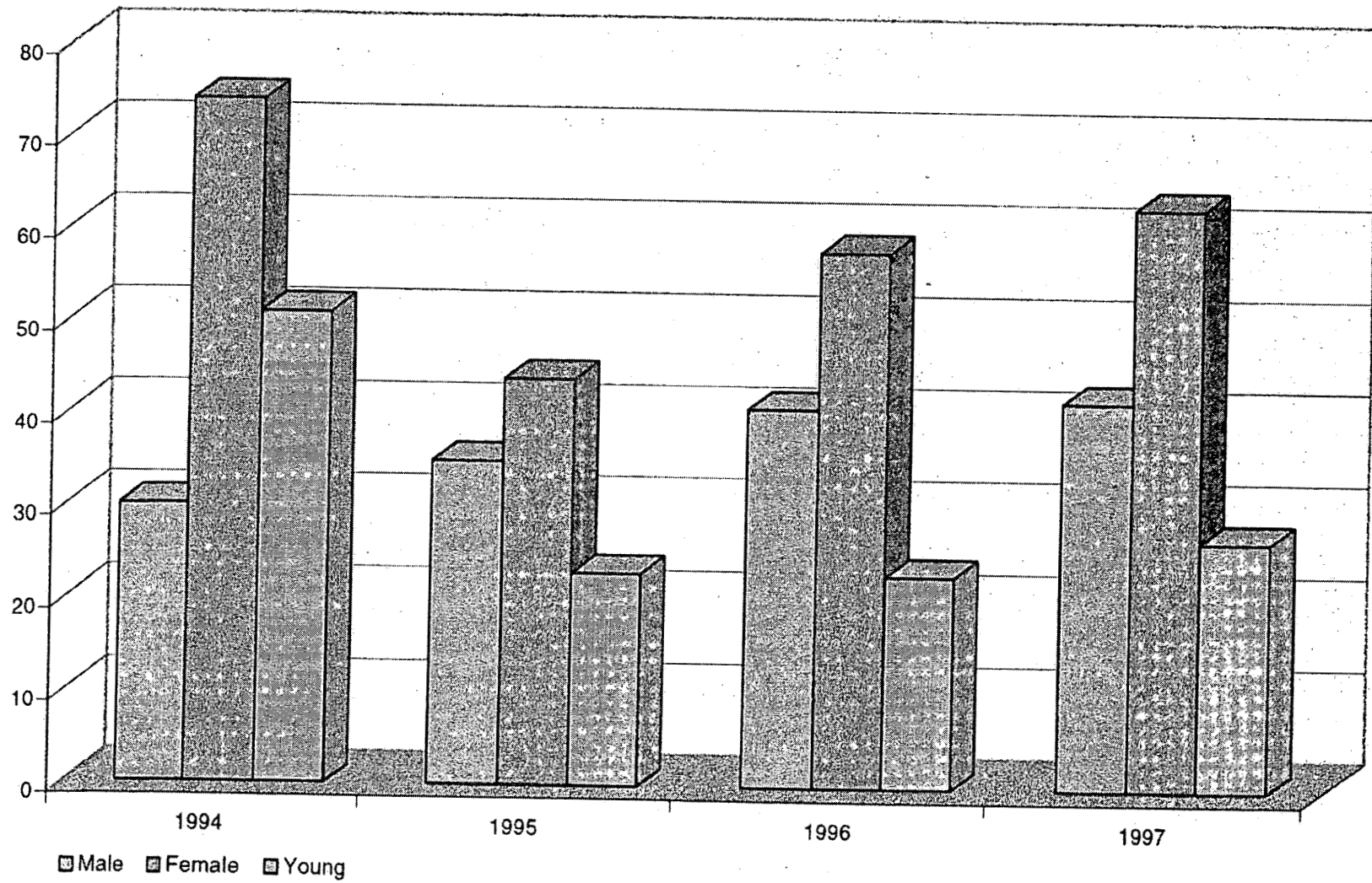
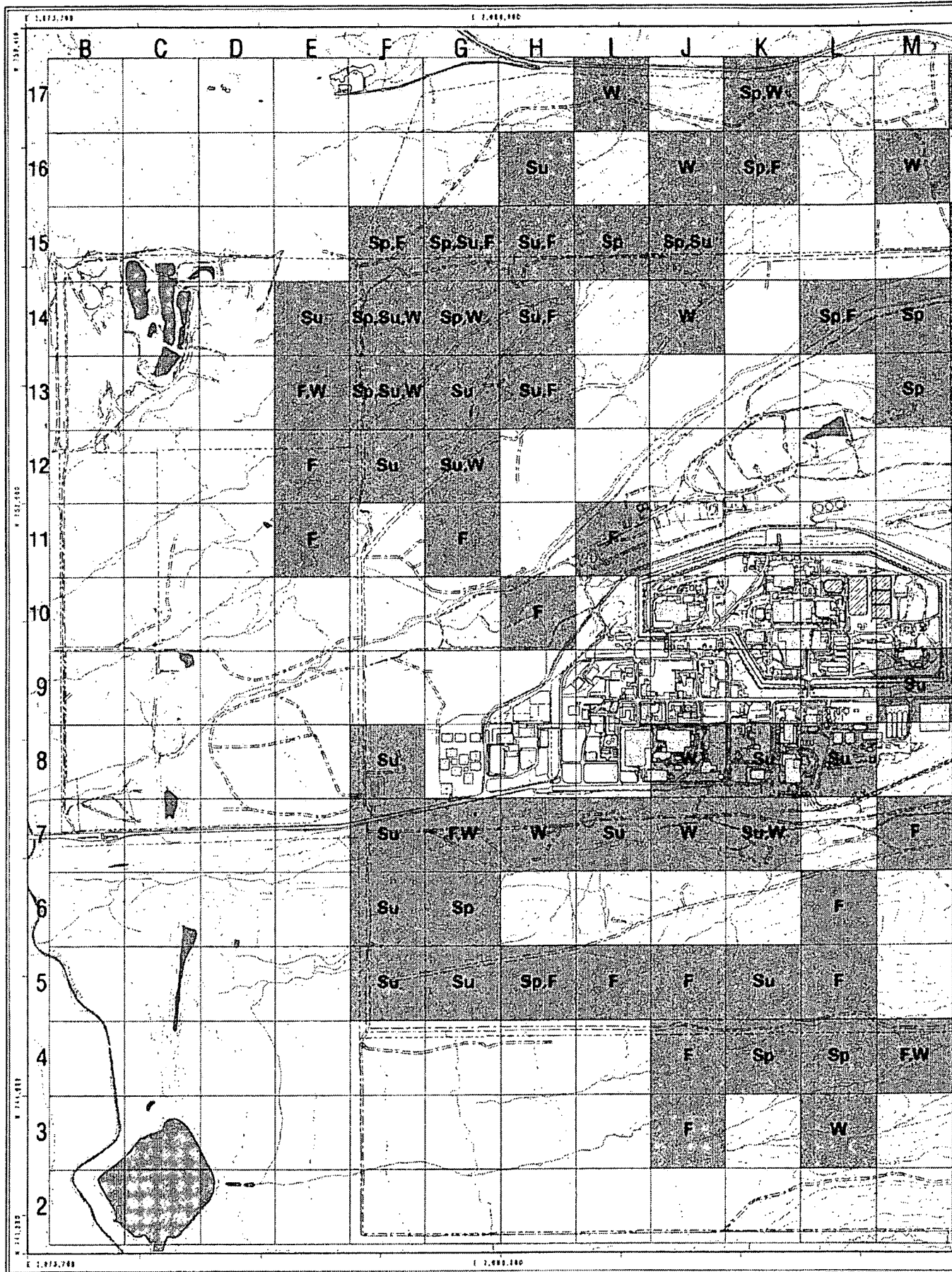
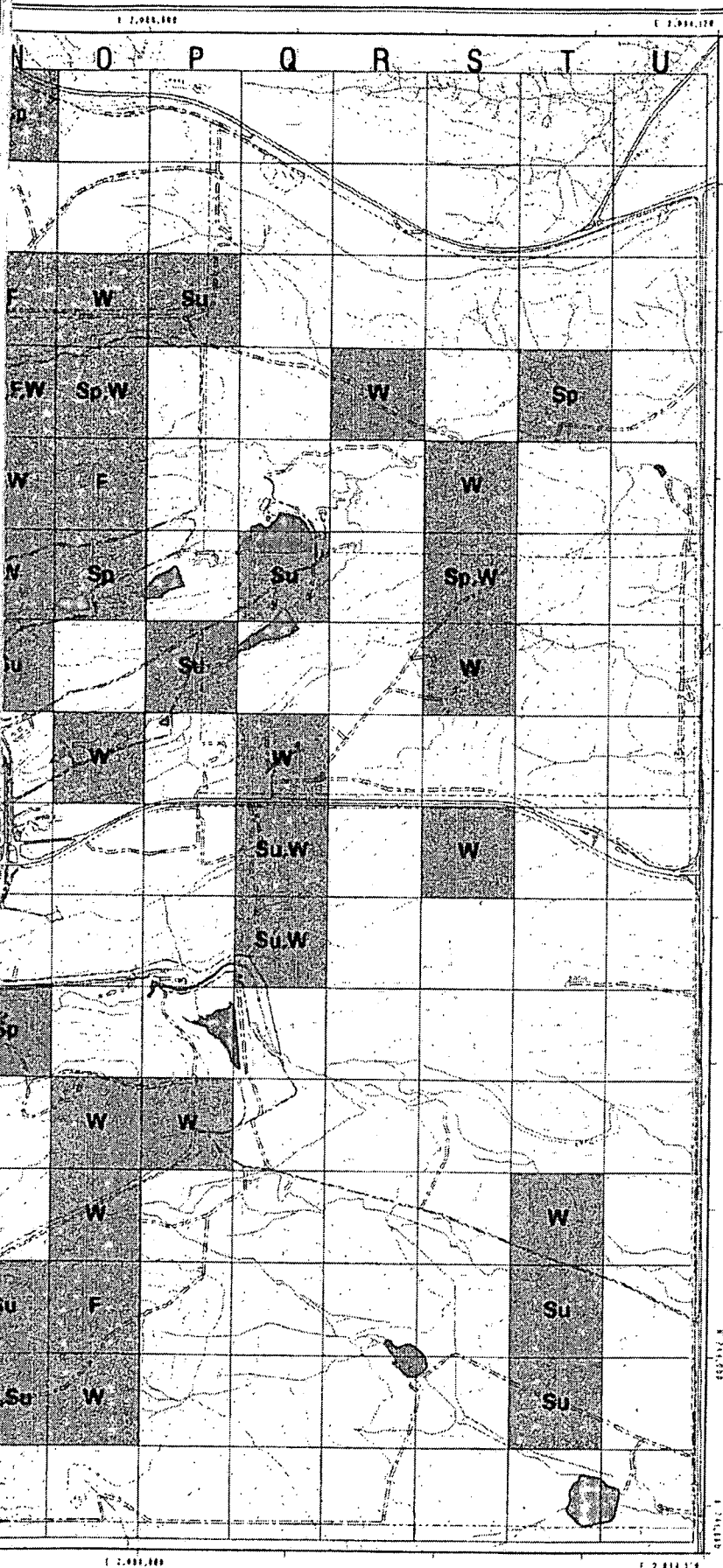


Figure 3-2. Annual Mule Deer Population Comparisons in Winter







**1997 Seasonal mule deer
use areas**
Figure 3-3.

MAP LEGEND

Mule deer use area

NOTE:

Sp = Spring
Su = Summer
F = Fall
W = Winter

Standard Map Features

- Buildings and other structures
- Solar evaporation ponds
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Contour (20-Foot)
- Paved roads
- Dirt roads

DATA SOURCE:

Buildings, fences, hydrography, roads and other structures from 1984 aerial fly-over data captured by ECHS RSL, Las Vegas. Topography (contours) were derived from digital elevation model (DEM) data by Morrison Knudsen (MK) using ERI Arc 7.0 and LATICE to produce the DEM data to create 5-foot contours. The DEM data was captured by the Parsons Seismic Lab, Las Vegas, NV, 1994. Aerial flyover at 10 meter resolution. The DEM post processing performed by MK, Winter 1997.



Scale = 1 : 21330
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State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

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Rocky Flats Environmental Technology Site

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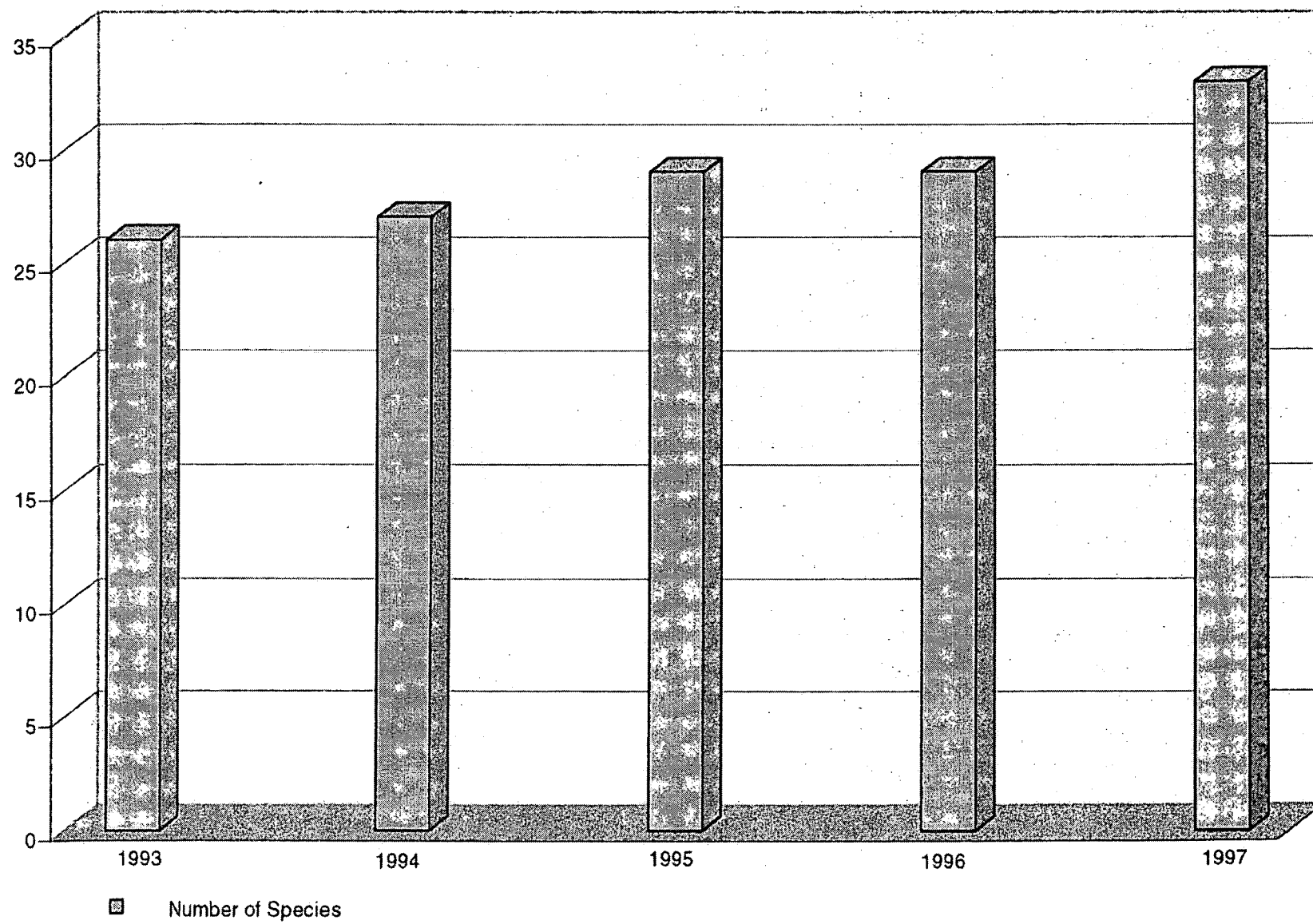
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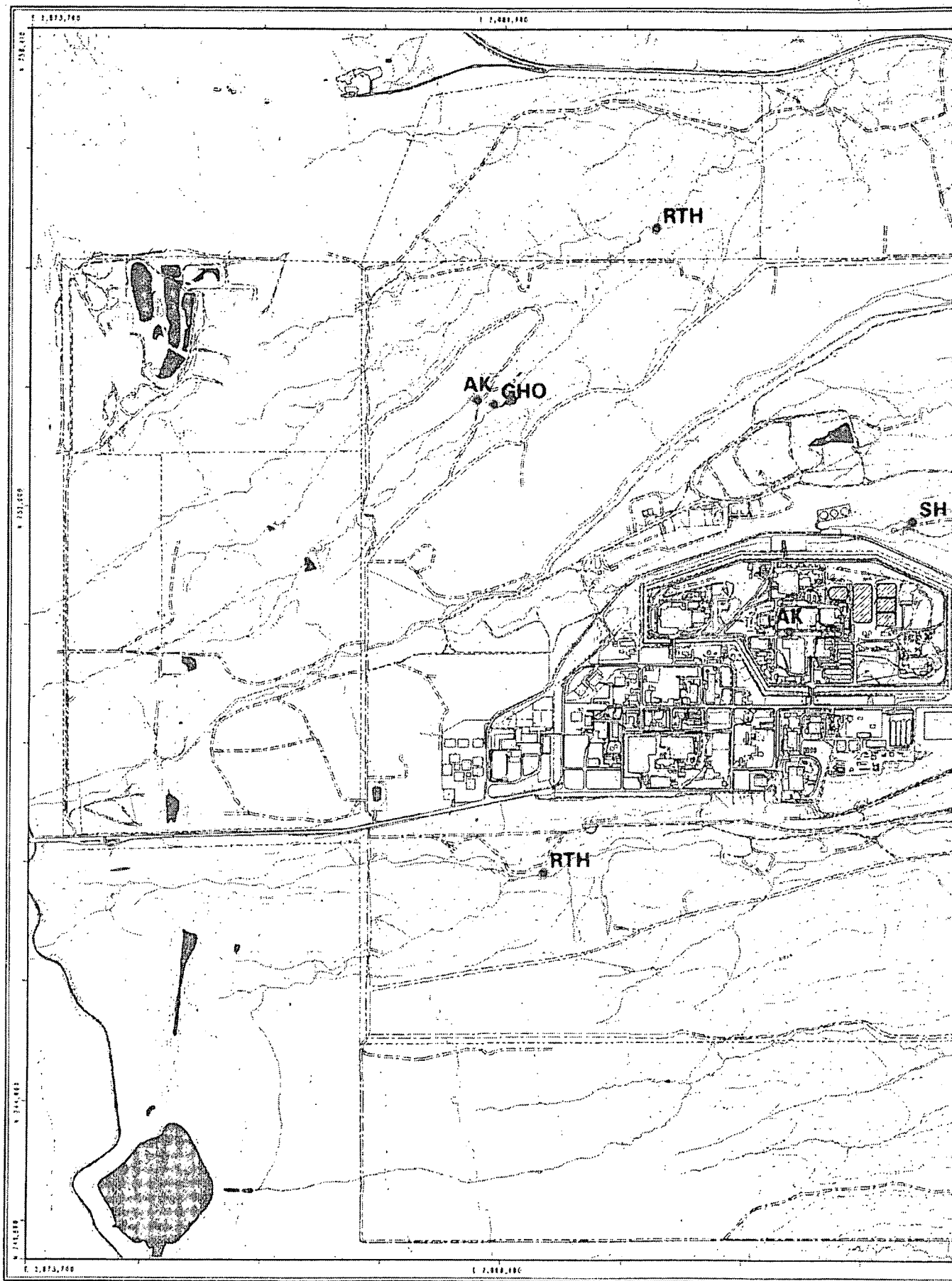
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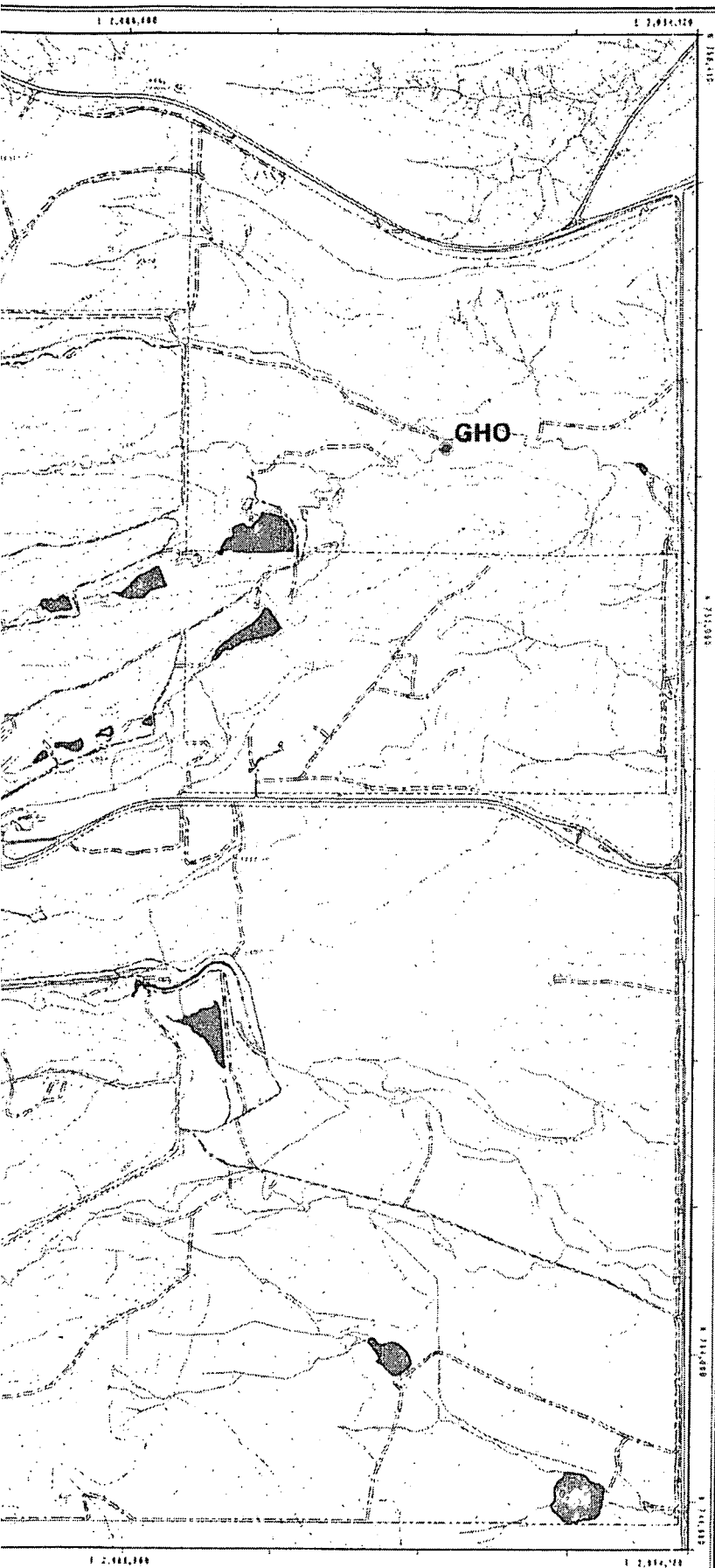
May 20, 1998

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Figure 3-4. Waterfowl Species .ded at Rocky Flats Annually







Raptor Nest Locations 1997

Figure 3-5.

MAP LEGEND

● Raptor nests

NOTE:

AK = American kestrel
GHO = Great horned owl
RTH = Red-tailed hawk
SH = Swainson's hawk

Standard Map Features

- Buildings and other structures
- Solar evaporation ponds
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Contour (20-Foot)
- Paved roads
- Dirt roads

DATA SOURCE:

Buildings, fences, hydrography, roads and other structures from 1996 aerial fly-over data captured by ECA/DOE, Las Vegas. DTM data from the stereophotographs. USGS Topography (contours) were derived from digital elevation model (DEM) data by American Electronic (AE) using ESRI Arc 12N and LANTICE to process the DEM data to create 5-foot contours. The DEM data was captured by the Remote Sensing Lab, Las Vegas, NV, 1996 Aerial Flyover at 10 meter resolution. The DEM post-processing performed by MK, Whittier 1997.



Scale = 1 : 21330
1 inch represents approximately 1778 feet



State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared
by:

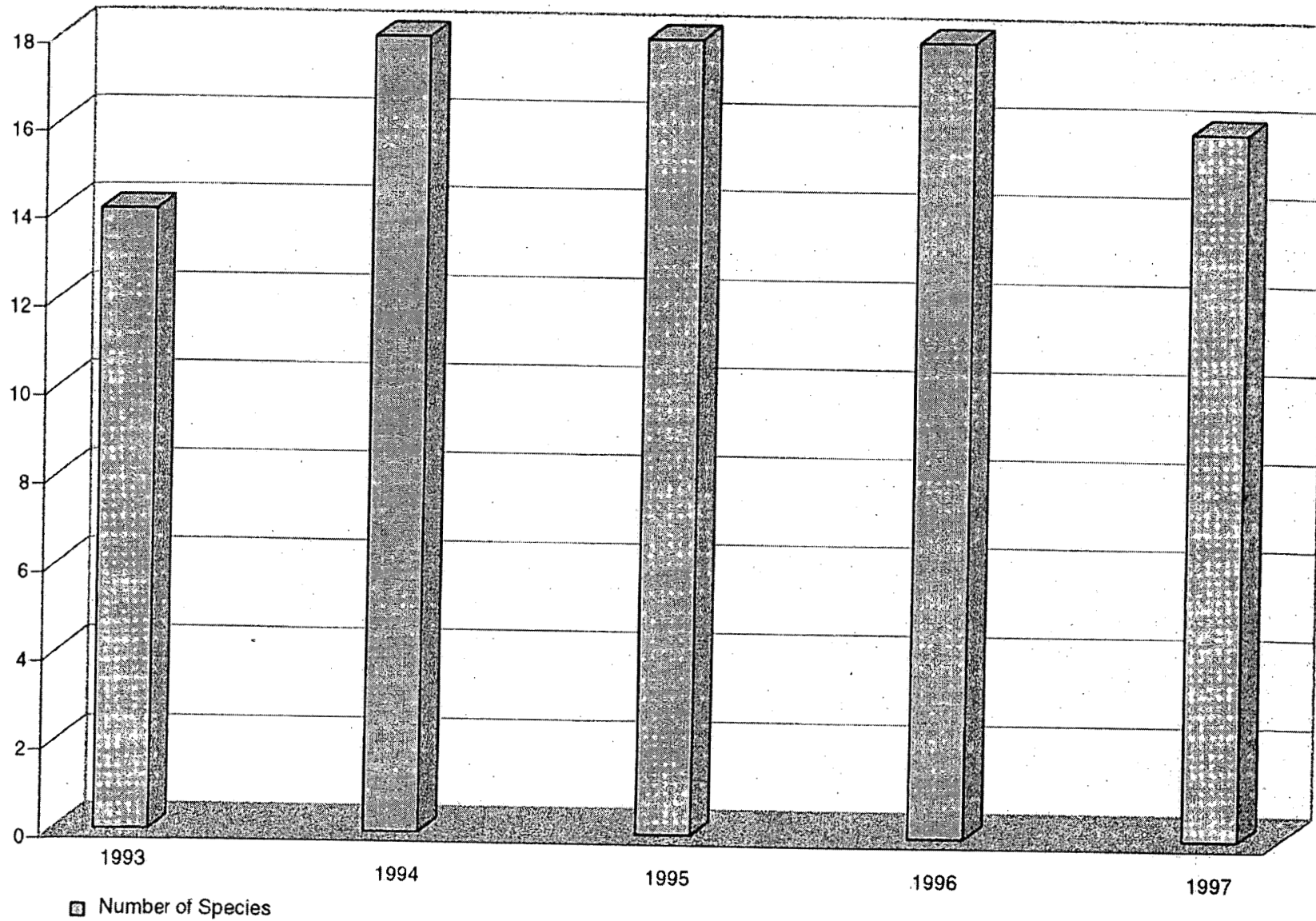
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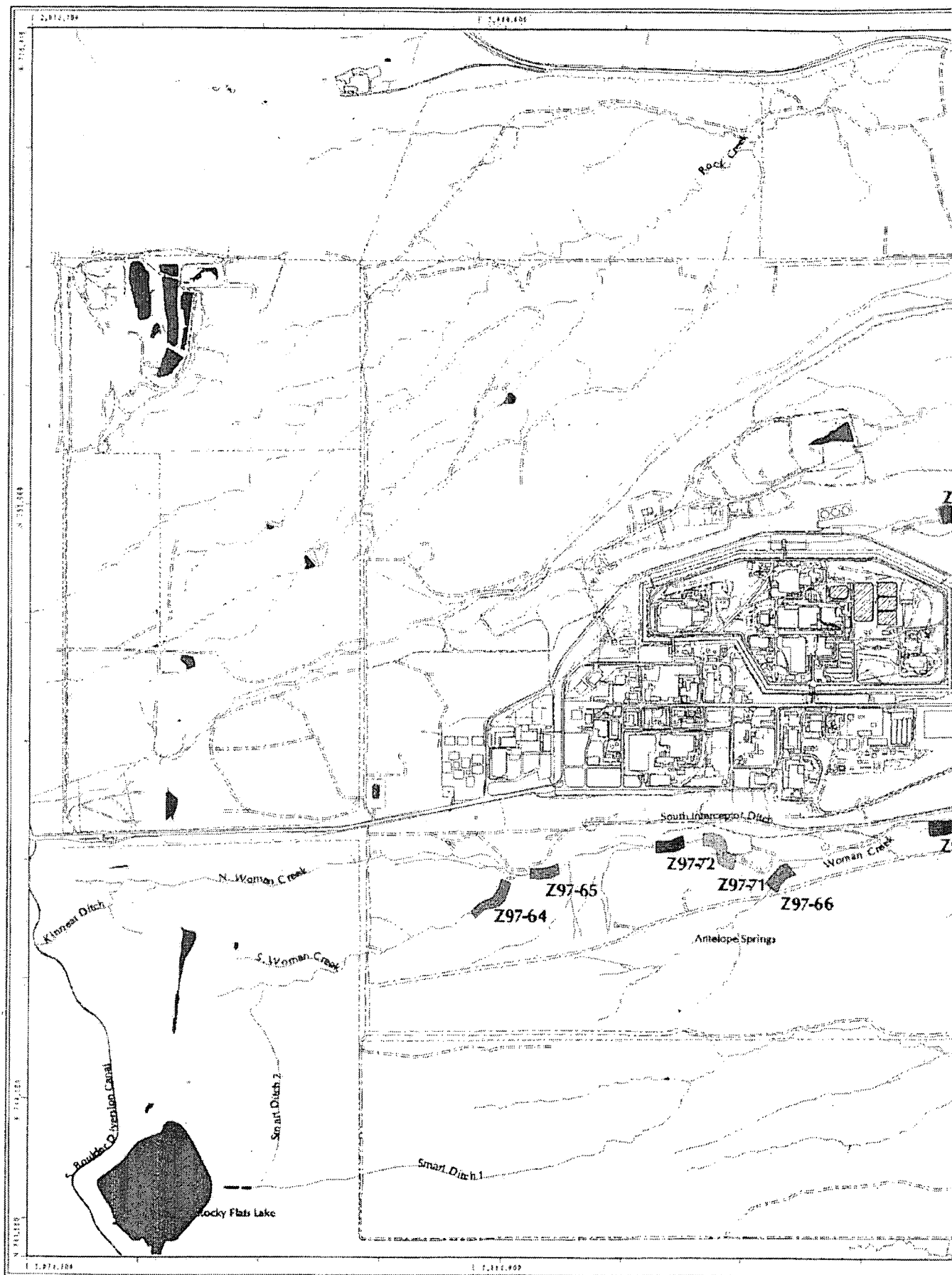
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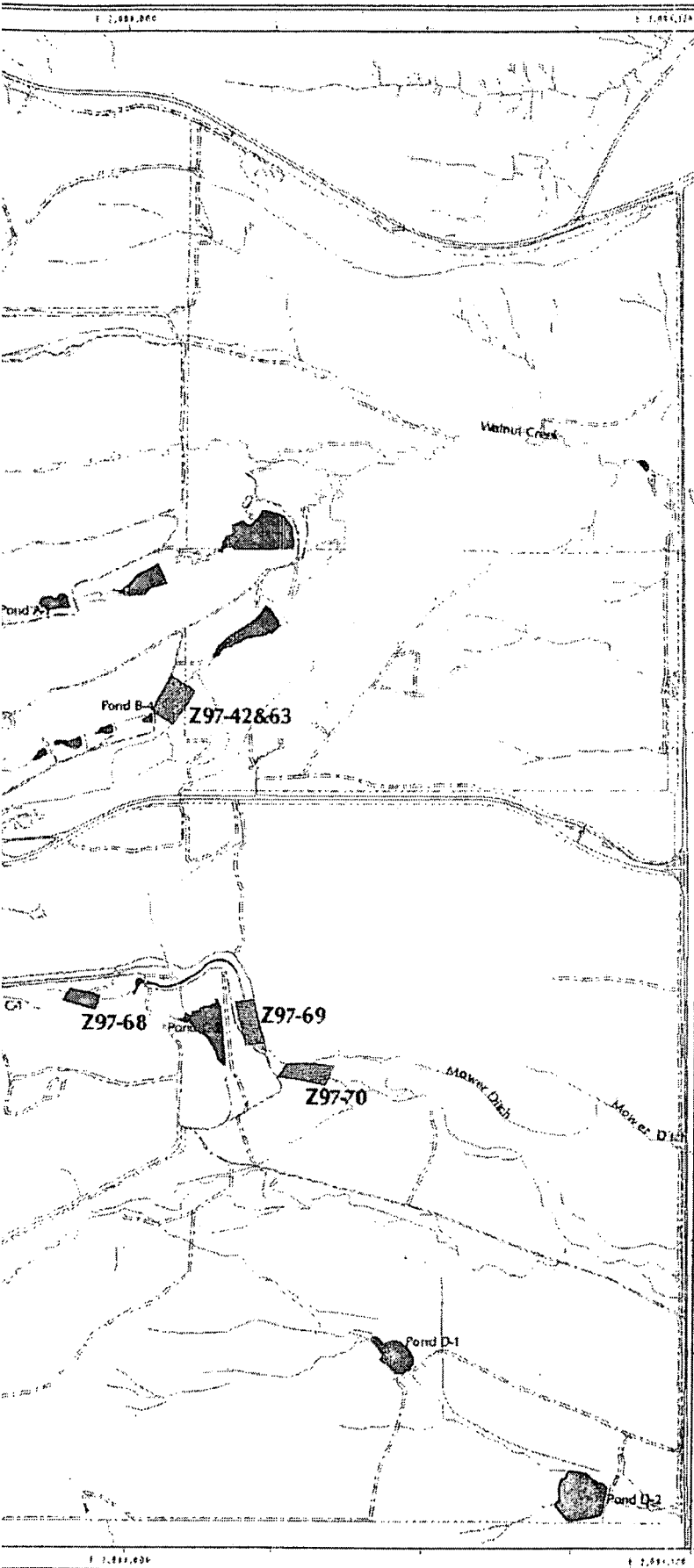
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Figure 3-6. Raptor Species Recorded at Rocky Flats Annually


















Locations of Preble's Meadow Jumping Mouse Trap Sites, 1997

Figure 3-7.

LEGEND

-  No Preble's mice caught
-  Preble's mice caught first session only
-  Preble's mice caught second session only
-  Preble's mice caught both sessions

Standard Map Features

-  Buildings and other structures
-  Solar evaporation ponds
-  Lakes and ponds
-  Streams, ditches, or other drainage features
-  Fences and other barriers
-  Paved roads
-  Dirt roads

DATA SOURCE:

Preble's meadow jumping mouse data
provided by Exponent Environmental,
Ecology Group - 1997.

NOTE:

These are Preble's meadow jumping mouse
successful and non-successful trapping
locations for 1997. This map is not to
be interpreted as a Preble's meadow
jumping mouse habitat map.

First session - June 3 - July 10
Second session - Aug 12 - 29



Scale = 1 : 21330
1 inch represents approximately 1778 feet

0 500 1000 2000 ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared
by:

Exponent™

MAP ID: p196-002

May 06, 1998

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Figure 3-8. Diversity index by habitat for All Years (1991, 1993-1997)

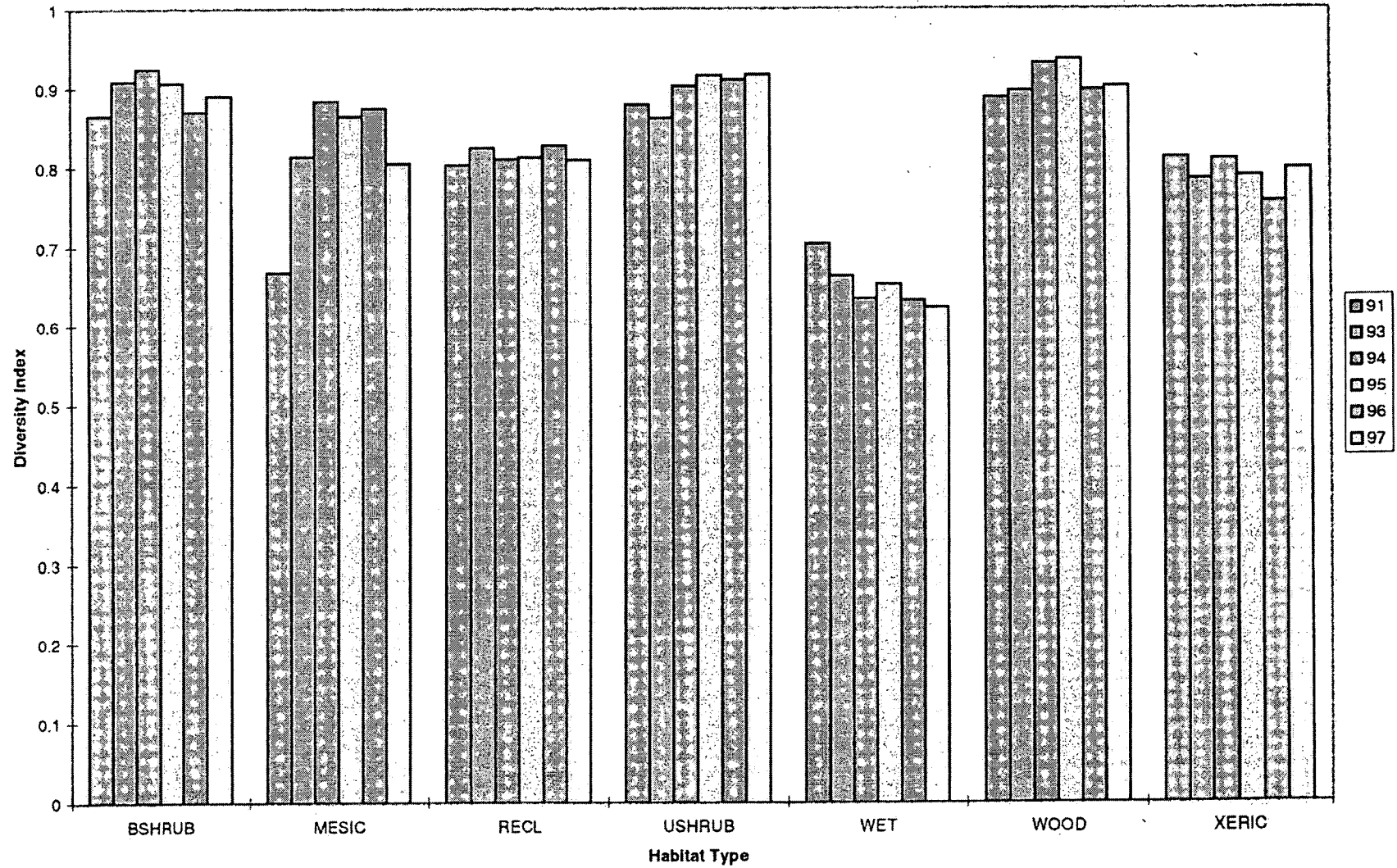


Figure 3-9. Annual variation of bird species richness in all habitats during the breeding season, 1991, 1993-1997.

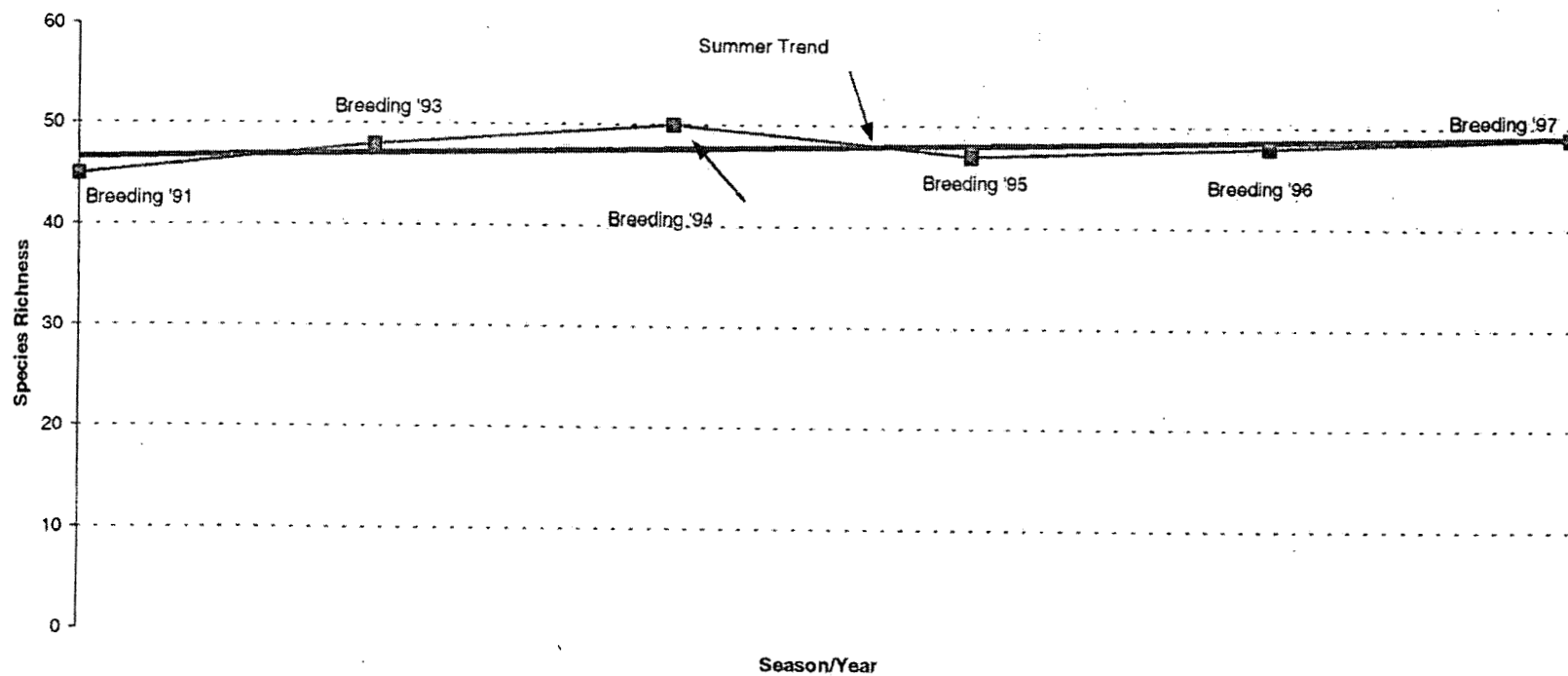


Figure 3-10. Trends in species richness of neotropical migrants in all habitats, 1991, 1993-1997.
Breeding = month of June

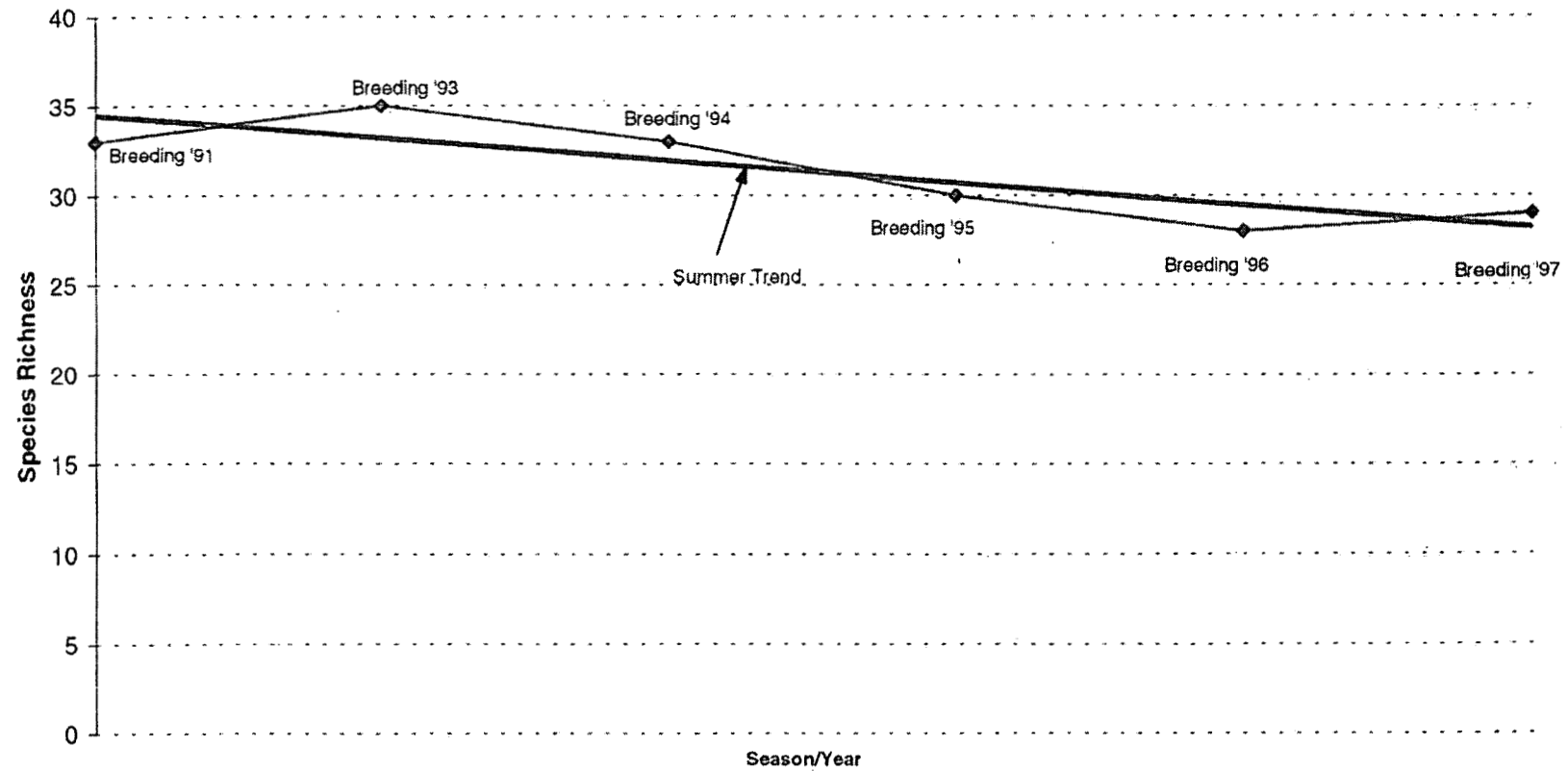


Figure 3-11. Spring bird species diversity (1994-1997).

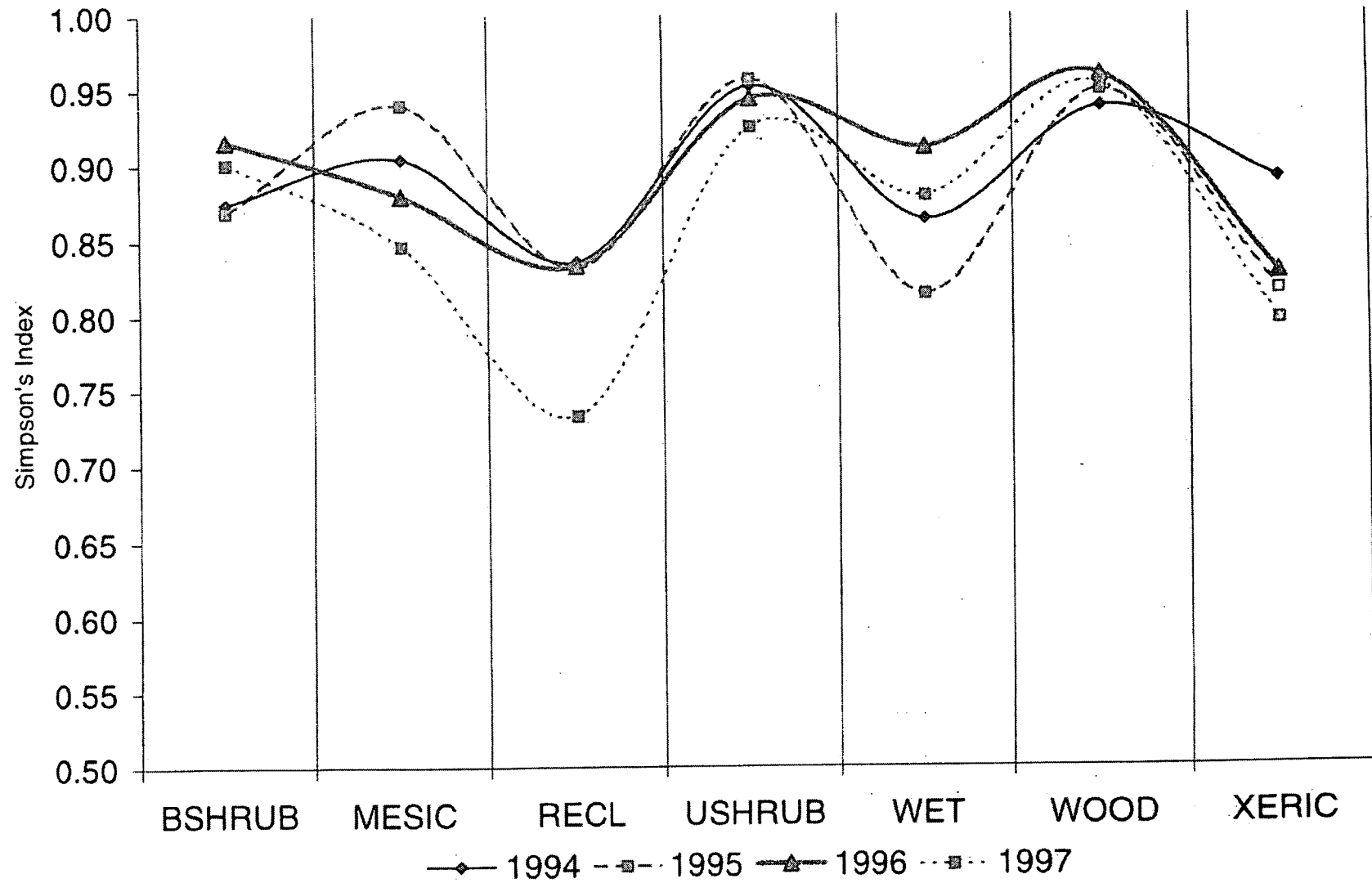


Figure 3-12. Fall bird species diversity (1994-1997).

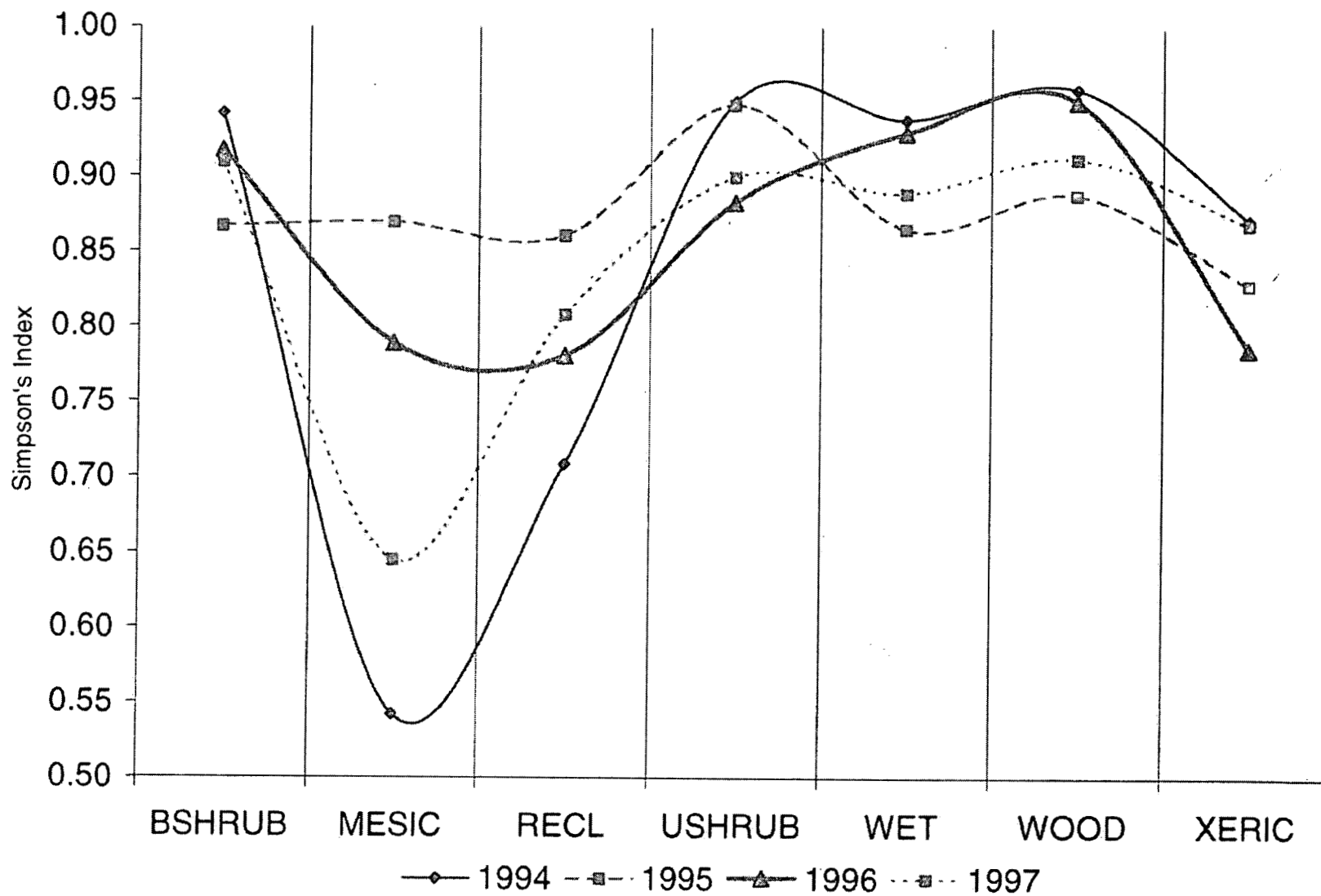


Figure 3-14. Fall bird sp richness (1994-1997).

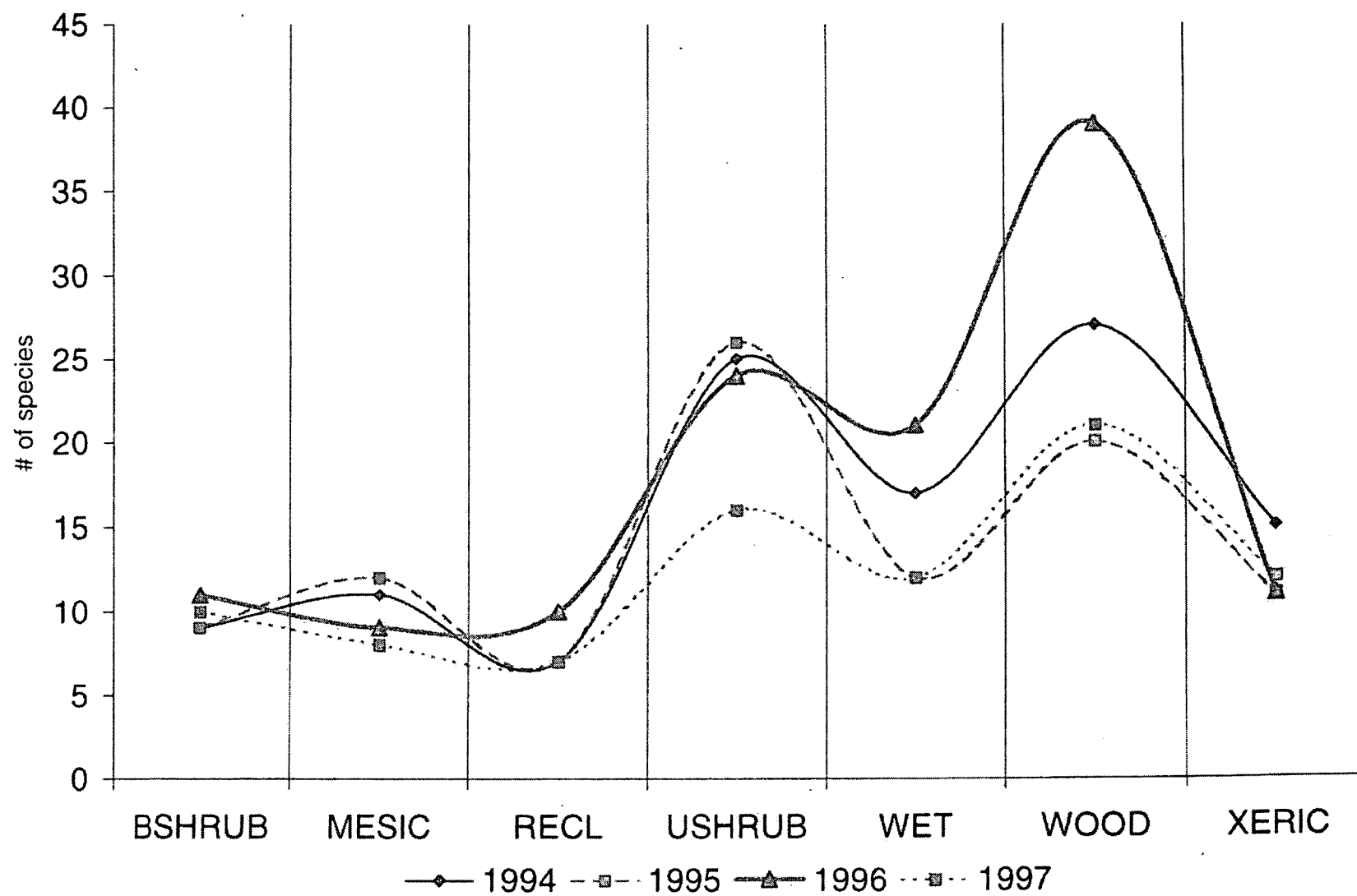
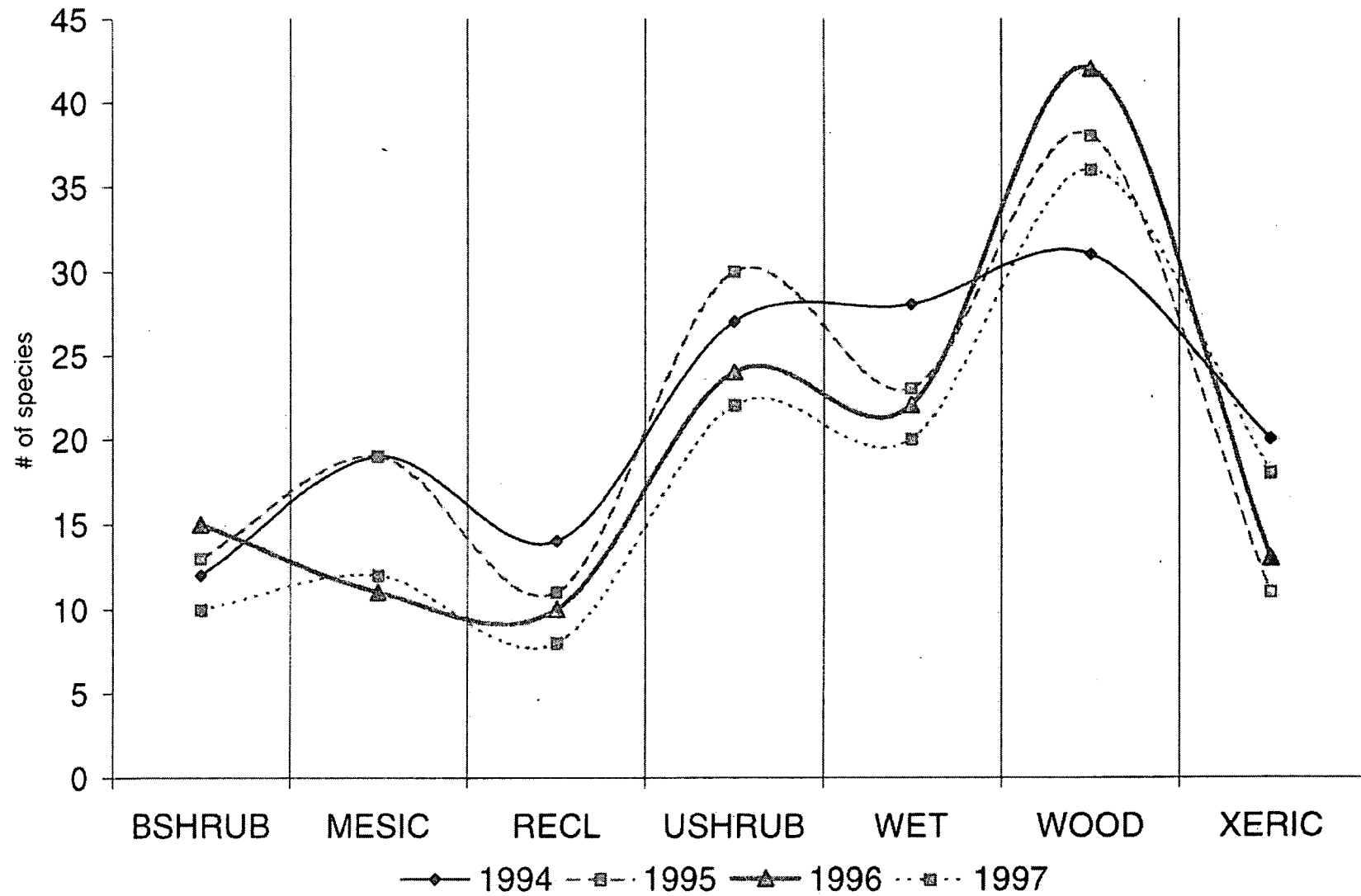


Figure 3-13. Spring bird species richness (1994-1997).



Tables

**TABLE 2-1. MULTI-SPECIES CENSUS SURVEY TRANSECTS,
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE**

Transect Number	Dominant Habitats Along Transect
RA01B	Wet Meadow (010), Short Marsh (020), Tall Marsh (030), Impoundment (054), Stream Pool (043)
RA02A	Wet Meadow (010), Short Marsh (020), Tall Marsh (030)
RA02B	Tall Marsh (030), Impoundment (054), Mudflats (093), Riparian Woodland (110), Mesic Grassland (322)
RA03B	Wet Meadow (010), Short Marsh (020), Tall Marsh (030)
RA04B	Wet Meadow (010), Short Marsh (020), Tall Marsh (030), Impoundment (054), Reclaimed Grassland(324)
RG01A	Reclaimed Grassland (324)
RG02A	Riparian Woodland (110),
RG02B	Xeric Grassland (323), Mesic Grassland (322)
RG03B	Xeric Grassland (323), Mesic Grassland (322)
RS01B	Tall Upland Shrubland (230), Mesic Grassland (322)
RS02B	Short Marsh (020), Tall Upland Shrubland (230), Mesic Grassland (322)
RS03B	<i>Amorpha</i> Riparian Shrubland (211), Riparian Woodland (110)
RW01A	Riparian Woodland (110), <i>Salix</i> Riparian Shrubland (212)
RW01B	Riparian Woodland (110), <i>Salix</i> Riparian Shrubland (212), Wet Meadow (010)
RW02B	Riparian Woodland (110), <i>Salix</i> Riparian Shrubland (212), Wet Meadow (010), Short Marsh (020)
RW03B	Riparian Woodland (110), <i>Salix</i> Riparian Shrubland (212), <i>Amorpha</i> Riparian Shrubland (211)

**TABLE 2-2. BIRD SURVEY TRANSECTS,
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE**

Transect Number	Transect Length	Dominant Habitats Along Transect
BA01A	1000 m	Tall Marsh (030)
BA01B	1000 m	Wet Meadow (010), Short Marsh (020), Tall Marsh (030), Stream Pool (043)
BA01R	1000 m	Wet Meadow (010), Short Marsh (020), Tall Marsh (030), Stream Pool (043)
BD02B	1000 m	Reclaimed Grassland (324)
BD03B	1000 m	Reclaimed Grassland (324)
BG01B	1000 m	Xeric Grassland (323)
BG01R	1000 m	Mesic Grassland (322)
BG02A	1000 m	Mesic Grassland (322), Reclaimed Grassland (324)
BG02B	1000 m	Xeric Grassland (323), Mesic Grassland (322)
BR02A	500 m	Reclaimed Grassland (324)
BS01B	1000 m	Tall Upland Shrubland (230), Mesic Grassland (322)
BS02B	1000 m	Short Marsh (020), Tall Upland Shrubland (230), Mesic Grassland (322)
BS03B	1000 m	Amorpha Riparian Shrubland (211), Riparian Woodland (110)
BW01A	1000 m	Riparian Woodland (110), Salix Riparian Shrubland (212)
BW01R	1000 m	Riparian Woodland (110), Salix Riparian Shrubland (212)
BX01A	100 m	Recovering Xeric Grassland (323)
BX01R	500 m	Xeric Grassland (323)
BX02R	500 m	Xeric Grassland (323)
BX01B	1000 m	Xeric Grassland (323)
BW01B	1000 m	Riparian Woodland (110), Salix Riparian Shrubland (212)

**TABLE 2-3. SPECIES FOR WHICH FLYOVER OBSERVATIONS
WERE INCLUDED IN ANALYSES**

Type	Common Name	Scientific Name
Nighthawks		
	Common Nighthawk	<i>Chordeiles minor</i>
	Common Poorwill	<i>Phalaenoptilus nuttallii</i>
Raptors		
	American Kestrel	<i>Falco sparverius</i>
	Bald Eagle	<i>Haliaeetus leucocephalus</i>
	Cooper's Hawk	<i>Accipiter cooperii</i>
	Ferruginous Hawk	<i>Buteo regalis</i>
	Golden Eagle	<i>Aquila chrysaetos</i>
	Merlin	<i>Falco columbarius</i>
	Northern Goshawk	<i>Accipiter gentilis</i>
	Northern Harrier	<i>Circus cyaneus</i>
	Osprey	<i>Pandion haliaetus</i>
	Peregrine Falcon	<i>Falco peregrinus</i>
	Prairie Falcon	<i>Falco mexicanus</i>
	Red-tailed Hawk	<i>Buteo jamaicensis</i>
	Rough-legged Hawk	<i>Buteo lagopus</i>
	Sharp-shinned Hawk	<i>Accipiter striatus</i>
	Swainson's Hawk	<i>Buteo swainsoni</i>
	Turkey Vulture	<i>Cathartes aura</i>
Swallows and Swifts		
	Barn Swallow	<i>Hirundo rustica</i>
	Black Swift	<i>Cypseloides niger</i>
	Cliff Swallow	<i>Hirundo pyrrhonota</i>
	Northern Rough-winged Swallow	<i>Steigodopteryx serripennis</i>
	Tree Swallow	<i>Tachycineta bicolor</i>
	Violet-green Swallow	<i>Tachycineta thalassina</i>

**TABLE 3-1. BIG GAME AREA USE AT ROCKY FL ENVIRONMENTAL TECHNOLOGY SITE IN 1997
BASED ON SITEWIDE SIGNIFICANT SPECIES SURVEYS**

Common Name	Species Code	Admin Area	RF Grid N	RF Grid E	Group Size	Male	Female	Young	Un- Classd
Winter									
Mule Deer	ODHE1	BZ	3	L	25	11	11	3	
Mule Deer	ODHE1	BZ	3	O	4	1	2	1	
Mule Deer	ODHE1	BZ	4	N	14	8	4	2	
Mule Deer	ODHE1	BZ	5	O	1	1			
Mule Deer	ODHE1	BZ	5	T	25	8	11	6	
Mule Deer	ODHE1	BZ	6	O	8	3	4	1	
Mule Deer	ODHE1	BZ	6	P	1	1			
Mule Deer	ODHE1	BZ	7	G	15	1	10	4	
Mule Deer	ODHE1	BZ	7	H	34	1	21	12	
Mule Deer	ODHE1	BZ	7	J	7		5	2	
Mule Deer	ODHE1	BZ	8	J	3		3		
Mule Deer	ODHE1	BZ	8	Q	7	1			6
Mule Deer	ODHE1	BZ	9	Q	5	5			
Mule Deer	ODHE1	BZ	9	S	7	7			
Mule Deer	ODHE1	BZ	10	O	5	2	2	1	
Mule Deer	ODHE1	BZ	10	Q	3	3			
Mule Deer	ODHE1	BZ	11	S	15	7	8		
White-tailed Deer	ODVI1	BZ	11	S	2		2		
Mule Deer	ODHE1	BZ	12	G	1			1	
Mule Deer	ODHE1	BZ	12	N	10	5	5		
Mule Deer	ODHE1	BZ	12	S	10	3	4	3	
White-tailed Deer	ODVI1	BZ	12	S	1		1		
Mule Deer	ODHE1	BZ	13	E	2	2			
Mule Deer	ODHE1	BZ	13	F	10		5	5	
Mule Deer	ODHE1	BZ	13	N	15	2	10	3	
Mule Deer	ODHE1	BZ	13	S	2	1	1		
Mule Deer	ODHE1	BZ	14	F	12	2	7	3	
Mule Deer	ODHE1	BZ	14	G	9		6	3	
Mule Deer	ODHE1	BZ	14	J	32	7	17	7	1
Mule Deer	ODHE1	BZ	14	N	7	4	2	1	
Mule Deer	ODHE1	BZ	14	O	11	8	3		
Mule Deer	ODHE1	BZ	14	R	8	8			
Mule Deer	ODHE1	BZ	15	O	2	2			
Mule Deer	ODHE1	BZ	16	J	7		7		
Mule Deer	ODHE1	BZ	16	M	6		3	3	
Mule Deer	ODHE1	BZ	17	I	1	1			
Mule Deer	ODHE1	BZ	17	K	7	2	3	2	
Spring									
Mule Deer	ODHE1	BZ	3	N	24	6	16	2	
Mule Deer	ODHE1	BZ	4	K	30	7	18	5	
Mule Deer	ODHE1	BZ	4	L	8	8			

TABLE 3-1. (cont.)

Common Name	Species Code	Admin Area	RF Grid N	RF Grid E	Group Size	Male	Female	Young	Un- Classd
Mule Deer	ODHE1	BZ	5	H	3	3			
Mule Deer	ODHE1	BZ	6	G	9				9
Mule Deer	ODHE1	BZ	7	N	1		1		
Mule Deer	ODHE1	BZ	12	O	5	1	4		
Mule Deer	ODHE1	BZ	12	S	2	2			
Mule Deer	ODHE1	BZ	13	F	14	8	1		5
Mule Deer	ODHE1	BZ	13	M	3		3		
White-tailed Deer	ODVI1	BZ	13	M	1		1		
Mule Deer	ODHE1	BZ	14	F	4	4			
Mule Deer	ODHE1	BZ	14	G	4	1	3		
Mule Deer	ODHE1	BZ	14	H	4				4
Mule Deer	ODHE1	BZ	14	L	5				5
Mule Deer	ODHE1	BZ	14	M	1				1
Mule Deer	ODHE1	BZ	14	O	10	10			
Mule Deer	ODHE1	BZ	14	T	7	5			2
Mule Deer	ODHE1	BZ	15	F	2		2		
Mule Deer	ODHE1	BZ	15	G	2		2		
Mule Deer	ODHE1	BZ	15	I	17	2			15
Mule Deer	ODHE1	BZ	15	J	32	8	2		22
Mule Deer	ODHE1	BZ	16	K	2				2
Mule Deer	ODHE1	BZ	16	N	6	6			
Mule Deer	ODHE1	BZ	17	N	8	8			
Summer									
Mule Deer	ODHE1	BZ	3	N	1		1		
Mule Deer	ODHE1	BZ	3	T	3				3
Mule Deer	ODHE1	BZ	4	N	1				1
Mule Deer	ODHE1	BZ	4	T	5				5
Mule Deer	ODHE1	BZ	5	F	2		1	1	
Mule Deer	ODHE1	BZ	5	G	1		1		
Mule Deer	ODHE1	BZ	5	K	2		1	1	
Mule Deer	ODHE1	BZ	6	F	3				3
Mule Deer	ODHE1	BZ	6	N	2				2
Mule Deer	ODHE1	BZ	7	F	5		3	2	
Mule Deer	ODHE1	BZ	7	I	1		1		
Mule Deer	ODHE1	BZ	7	K	2	1	1		
Mule Deer	ODHE1	BZ	8	F	1		1		
Mule Deer	ODHE1	BZ	8	K	3		1	2	
Mule Deer	ODHE1	BZ	8	L	3		1	2	
Mule Deer	ODHE1	BZ	8	Q	2		2		
Mule Deer	ODHE1	BZ	9	M	1		1		
Mule Deer	ODHE1	BZ	9	Q	3	3			
Mule Deer	ODHE1	BZ	11	N	1				1
Mule Deer	ODHE1	BZ	11	P	3	1	1		1
Mule Deer	ODHE1	BZ	12	F	1	1			
Mule Deer	ODHE1	BZ	12	G	1				1
Mule Deer	ODHE1	BZ	12	Q	2		2		

TABLE 3-1. (cont.)

Common Name	Species Code	Admin Area	RF Grid N	RF Grid E	Group Size	Male	Female	Young	Un- Classd
Mule Deer	ODHE1	BZ	13	F	4		2	2	
Mule Deer	ODHE1	BZ	13	G	1	1			
White-tailed Deer	ODVI1	BZ	13	G	1		1		
Mule Deer	ODHE1	BZ	13	H	3	1	2		
Mule Deer	ODHE1	BZ	14	E	2		1	1	
Mule Deer	ODHE1	BZ	14	F	2	1			1
Mule Deer	ODHE1	BZ	14	H	1	1			
Mule Deer	ODHE1	BZ	14	N	2	1	1		
Mule Deer	ODHE1	BZ	15	G	3		1	2	
Mule Deer	ODHE1	BZ	15	H	3		3		
Mule Deer	ODHE1	BZ	15	J	2	2			
Mule Deer	ODHE1	BZ	15	P	6	4			2
Mule Deer	ODHE1	BZ	16	H	4				4
Fall									
Mule Deer	ODHE1	BZ	3	J	1		1		
Mule Deer	ODHE1	BZ	4	J	2	1	1		
Mule Deer	ODHE1	BZ	4	M	3		2	1	
Mule Deer	ODHE1	BZ	4	O	5	1	3	1	
Mule Deer	ODHE1	BZ	5	H	4		3	1	
Mule Deer	ODHE1	BZ	5	I	11	2	8	1	
White-tailed Deer	ODVI1	BZ	5	I	1		1		
Mule Deer	ODHE1	BZ	5	J	28	8	19	1	
Mule Deer	ODHE1	BZ	5	L	1	1			
Mule Deer	ODHE1	BZ	6	L	1	1			
Mule Deer	ODHE1	BZ	7	F	1	1			
Mule Deer	ODHE1	BZ	7	M	7	4	3		
Mule Deer	ODHE1	BZ	10	H	1		1		
Mule Deer	ODHE1	BZ	11	E	11		7	4	
Mule Deer	ODHE1	BZ	11	G	1	1			
Mule Deer	ODHE1	BZ	11	I	1		1		
Mule Deer	ODHE1	BZ	12	E	8	1	7		
Mule Deer	ODHE1	BZ	13	E	2	2			
Mule Deer	ODHE1	BZ	13	H	1		1		
Mule Deer	ODHE1	BZ	13	N	2	2			
Mule Deer	ODHE1	BZ	13	O	1		1		
Mule Deer	ODHE1	BZ	14	H	1				1
Mule Deer	ODHE1	BZ	14	L	1	1			
Mule Deer	ODHE1	BZ	14	N	1	1			
Mule Deer	ODHE1	BZ	15	F	4	2	2		
Mule Deer	ODHE1	BZ	15	G	8	5	3		
Mule Deer	ODHE1	BZ	15	H	11	5	6		
White-tailed Deer	ODVI1	BZ	15	H	1		1		
Mule Deer	ODHE1	BZ	15	N	1	1			
Mule Deer	ODHE1	BZ	16	K	15	7	7	1	

**TABLE 3-2. BIG GAME RELATIVE ABUNDANCE BY HABITAT AT ROCK FLATS
ENVIRONMENTAL TECHNOLOGY SITE IN 1997 BASED ON MULTI-SPECIES SURVEYS**

Season	Common Name	Species Code	Habitat Type	Number of Obs.	Observations/ Minute in Habitat ^a	Percent of Species/ Habitat	Total number of Observations for Species
Winter							
	Mule Deer	ODHE1	10	1	0.030	0.57	
	Mule Deer	ODHE1	110	5	0.016	2.84	
	Mule Deer	ODHE1	230	18	0.115	10.23	
	Mule Deer	ODHE1	322	141	1.640	80.11	
	Mule Deer	ODHE1	323	1	0.007	0.57	
	Mule Deer	ODHE1	324	10	0.625	5.68	176
Spring							
	Mule Deer	ODHE1	110	29	0.071	16.38	
	Mule Deer	ODHE1	230	39	0.188	22.03	
	Mule Deer	ODHE1	322	72	0.911	40.68	
	Mule Deer	ODHE1	323	37	0.199	20.90	177
	White-tailed Deer	ODVI1	323	2	0.011	100.00	2
Summer							
	Mule Deer	ODHE1	10	1	0.014	1.04	
	Mule Deer	ODHE1	20	2	0.025	2.08	
	Mule Deer	ODHE1	30	7	0.055	7.29	
	Mule Deer	ODHE1	110	19	0.058	19.79	
	Mule Deer	ODHE1	211	7	0.119	7.29	
	Mule Deer	ODHE1	212	6	0.065	6.25	
	Mule Deer	ODHE1	230	36	0.170	37.50	
	Mule Deer	ODHE1	322	13	0.169	13.54	
	Mule Deer	ODHE1	323	3	0.024	3.13	
	Mule Deer	ODHE1	324	2	0.059	2.08	96
	White-tailed Deer	ODVI1	212	3	0.033	100.00	3
Fall							
	Mule Deer	ODHE1	10	4	0.063	3.25	
	Mule Deer	ODHE1	20	17	0.183	13.82	
	Mule Deer	ODHE1	110	15	0.048	12.20	
	Mule Deer	ODHE1	211	3	0.055	2.44	
	Mule Deer	ODHE1	212	17	0.198	13.82	
	Mule Deer	ODHE1	230	45	0.247	36.59	
	Mule Deer	ODHE1	322	22	0.355	17.89	123
	White-tailed Deer	ODVI1	20	1	0.011	50.00	
	White-tailed Deer	ODVI1	230	1	0.005	50.00	2
	Mule X White-tailed Hybrid	ODXVI	230	1	0.005	100.00	1

^a Relative abundance value

**TABLE 3-3. LAGOMORPH, LARGE RODENT, AND BAT RELATIVE ABUNDANCE
BY HABITAT AT ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE IN 1997
BASED ON MULTI-SPECIES CENSUS SURVEYS**

Common Name	Species Code	Habitat Type	Number of Observations	Observations/ Minute in Habitat ^a	Percent of Species/ Habitat	Total number of Observations for Species
Lagomorphs						
Winter						
Desert Cottontail	SYAU1	420	2	0.154	100.00	2
Spring						
Desert Cottontail	SYAU1	410	2	0.182	40.00	5
Desert Cottontail	SYAU1	530	2	0.182	40.00	
Desert Cottontail	SYAU1	540	1	0.091	20.00	
Summer						
Desert Cottontail	SYAU1	110	3	0.009	23.08	13
Desert Cottontail	SYAU1	322	3	0.039	23.08	
Desert Cottontail	SYAU1	410	3	0.231	23.08	
Desert Cottontail	SYAU1	420	1	0.077	7.69	
Desert Cottontail	SYAU1	540	3	0.231	23.08	
Fall						
Jackrabbit	LEP1	323	1	0.006	100.00	1
Desert Cottontail	SYAU1	322	2	0.032	33.33	6
Desert Cottontail	SYAU1	324	1	0.006	16.67	
Desert Cottontail	SYAU1	530	1	0.063	16.67	
Desert Cottontail	SYAU1	540	2	0.038	33.33	
Rodents						
Spring						
Muskrat	ONZI1	54	1	0.007	100.00	1
Summer						
Muskrat	ONZI1	54	1	0.010	100.00	1
Fall						
Muskrat	ONZI1	54	3	0.037	100.00	3
Bats						
Summer						
Big Brown Bat	EPFU1	54	1	0.010	100.00	1

^a Relative abundance value

**TABLE 3-4. LAGOMORPH AND LARGE RODENT AREA USE AT ROCKY FLATS
ENVIRONMENTAL TECHNOLOGY SITE IN 1997 BASED ON SITEWIDE SIGNIFICANT SPECIES SURVEYS**

Common Name	Species Code	Admin Area	RF Grid N	RF Grid E	Group Size	Male	Female	Young	Un- Classd
Winter									
Black-tailed Prairie Dog	CYLU1	BZ	2	O	1				1
Black-tailed Prairie Dog	CYLU1	BZ	8	T	4				4
Desert Cottontail	SYAU1	BZ	13	L	1				1
Jackrabbit Species	Jackrabbit Species	BZ	8	F	2				2
Jackrabbit Species	Jackrabbit Species	BZ	13	G	1				1
Summer									
Desert Cottontail	SYAU1	BZ	7	P	1				1
Desert Cottontail	SYAU1	BZ	8	L	7				7
Desert Cottontail	SYAU1	BZ	8	N	2				2
Desert Cottontail	SYAU1	BZ	11	N	5		3		2
Desert Cottontail	SYAU1	BZ	12	J	1				1
Desert Cottontail	SYAU1	BZ	13	N	1				1
Desert Cottontail	SYAU1	BZ	14	P	3				3
Muskrat	ONZI1	BZ	12	O	1				1
Fall									
Black-tailed Prairie Dog	CYLU1	BZ	2	N	3				3
Black-tailed Prairie Dog	CYLU1	BZ	2	O	6				6
Muskrat	ONZI1	BZ	10	O	1				1

**TABLE 3-5. CARNIVORE RELATIVE ABUNDANCE BY HABITAT AT
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE IN 1997
BASED ON MULTI-SPECIES CENSUS SURVEYS**

Season	Common Name	Species Code	Habitat Type	Number of Observations	Observations/ Minute in Habitat ^a	Percent of Species/ Habitat	Total number of Observations for Species
Winter							
	Coyote	CALA1	20	8	0.063	42.11	
	Coyote	CALA1	54	1	0.016	5.26	
	Coyote	CALA1	110	2	0.006	10.53	
	Coyote	CALA1	211	1	0.026	5.26	
	Coyote	CALA1	230	5	0.320	26.32	
	Coyote	CALA1	323	2	0.130	10.53	19
Spring							
	Coyote	CALA1	20	1	0.006	12.50	
	Coyote	CALA1	30	1	0.010	12.50	
	Coyote	CALA1	212	1	0.007	12.50	
	Coyote	CALA1	230	1	0.005	12.50	
	Coyote	CALA1	323	4	0.022	50.00	8
Summer							
	Coyote	CALA1	230	1	0.005	50.00	
	Coyote	CALA1	322	1	0.013	50.00	2
	American Black Bear	URAM1	110	1	0.003	100.00	1
Fall							
	Coyote	CALA1	20	2	0.022	18.18	
	Coyote	CALA1	110	2	0.006	18.18	
	Coyote	CALA1	230	4	0.022	36.36	
	Coyote	CALA1	323	3	0.019	27.27	11
	Raccoon	PRLO1	212	1	0.012	100.00	1

^a Relative abundance value

**TABLE 3-6. CARNIVORE AREA USE AT ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
IN 1997 BASED ON SITEWIDE SIGNIFICANT SPECIES SURVEYS**

Common Name	Species Code	Admin Area	RF Grid N	RF Grid E	Group Size	Male	Female	Young	Un- Classd
Winter									
Coyote	CALA1	BZ	2	M	1				1
Coyote	CALA1	BZ	3	N	1				1
Coyote	CALA1	BZ	4	I	1				1
Coyote	CALA1	BZ	5	F	1				1
Coyote	CALA1	BZ	5	I	1				1
Coyote	CALA1	BZ	6	F	1				1
Coyote	CALA1	BZ	10	U	2				2
Coyote	CALA1	BZ	11	O	1				1
Coyote	CALA1	BZ	11	S	1				1
Coyote	CALA1	BZ	14	E	1				1
Coyote	CALA1	BZ	14	L	2				2
Coyote	CALA1	BZ	16	M	1				1
Spring									
Coyote	CALA1	BZ	2	J	1				1
Coyote	CALA1	BZ	2	T	1				1
Coyote	CALA1	BZ	4	L	2				2
Coyote	CALA1	BZ	5	F	1				1
Coyote	CALA1	BZ	5	Q	1				1
Coyote	CALA1	BZ	15	G	1				1
Coyote	CALA1	BZ	17	N	1				1
Summer									
Coyote	CALA1	BZ	3	F	3				3
Coyote	CALA1	BZ	5	P	1			1	
Coyote	CALA1	BZ	6	Q	2				2
Coyote	CALA1	BZ	6	R	1				1
Coyote	CALA1	BZ	11	Q	1				1
Coyote	CALA1	BZ	12	Q	1				1
Fall									
Coyote	CALA1	BZ	3	R	1				1
Coyote	CALA1	BZ	3	S	1				1
Coyote	CALA1	BZ	4	M	1				1
Coyote	CALA1	BZ	12	S	1				1
Coyote	CALA1	BZ	13	P	1			1	
Coyote	CALA1	BZ	15	G	1				1
Coyote	CALA1	BZ	16	M	1				1

**TABLE 3-7. WATERFOWL RELATIVE ABUNDANCE BY HABITAT AT ROCKY FLATS
ENVIRONMENTAL TECHNOLOGY SITE IN 1997 BASED ON
MULTI-SPECIES CENSUS SURVEYS**

Season	Common Name	Species Code	Habitat Type	Number of Observations	Observations/ Minute in Habitat ^a	Percent of Species/ Habitat	Total number of Observations for Species
Winter							
	Green-winged Teal	ANCR1	30	2	0.042	11.76	
	Green-winged Teal	ANCR1	54	15	0.242	88.24	17
	Mallard	ANPL1	54	17	0.274	100.00	17
	Redhead	AYAM1	54	54	0.871	100.00	54
	Bufflehead	BUAL1	54	1	0.016	100.00	1
	Common Goldeneye	BUCL1	54	9	0.145	100.00	9
	Common Snipe	GAGA1	20	1	0.008	100.00	1
Spring							
	Spotted Sandpiper	ACMA1	93	4	0.160	100.00	4
	Green-winged Teal	ANCR1	54	92	0.622	100.00	92
	Cinnamon Teal	ANCY1	54	17	0.115	100.00	17
	Blue-winged Teal	ANDI1	54	12	0.081	100.00	12
	Mallard	ANPL1	20	2	0.012	1.45	
	Mallard	ANPL1	30	1	0.010	0.72	
	Mallard	ANPL1	43	2	0.182	1.45	
	Mallard	ANPL1	46	2	0.182	1.45	
	Mallard	ANPL1	54	122	0.824	88.41	
	Mallard	ANPL1	212	7	0.052	5.07	
	Mallard	ANPL1	230	2	0.010	1.45	138
	Gadwall	ANST1	54	56	0.378	100.00	56
	Great Blue Heron	ARHE1	30	1	0.010	14.29	
	Great Blue Heron	ARHE1	54	5	0.034	71.43	
	Great Blue Heron	ARHE1	110	1	0.002	14.29	7
	Lesser Scaup	AYAF1	54	16	0.108	100.00	16
	Redhead	AYAM1	54	14	0.095	100.00	14
	Ring-necked Duck	AYCO1	54	26	0.176	100.00	26
	Greater Scaup	AYMA1	54	33	0.223	100.00	33
	Canada Goose	BRCA1	54	6	0.041	54.55	
	Canada Goose	BRCA1	93	1	0.040	9.09	
	Canada Goose	BRCA1	322	4	0.051	36.36	11
	Bufflehead	BUAL1	54	37	0.250	100.00	37
	Killdeer	CHVO1	93	31	1.240	88.57	
	Killdeer	CHVO1	110	1	0.002	2.86	
	Killdeer	CHVO1	324	3	0.086	8.57	35
	American Coot	FUAM1	30	3	0.030	6.98	
	American Coot	FUAM1	54	40	0.270	93.02	43
	Common Snipe	GAGA1	20	8	0.047	40.00	
	Common Snipe	GAGA1	30	8	0.081	40.00	
	Common Snipe	GAGA1	43	1	0.091	5.00	
	Common Snipe	GAGA1	110	1	0.002	5.00	
	Common Snipe	GAGA1	212	1	0.007	5.00	
	Common Snipe	GAGA1	230	1	0.005	5.00	20
	Common Merganser	MEME1	54	32	0.216	100.00	32
	Ruddy Duck	OXJA1	54	7	0.047	100.00	7
	Double-crested Cormorant	PHAU1	54	3	0.020	75.00	
	Double-crested Cormorant	PHAU1	322	1	0.013	25.00	4
	Wilson's Phalarope	PHTR1	54	2	0.014	100.00	2
	Eared Grebe	PONI1	54	2	0.014	100.00	2
	Pied-billed Grebe	POPO1	54	14	0.095	100.00	14
	Greater Yellowlegs	TRME1	54	6	0.041	85.71	
	Greater Yellowlegs	TRME1	93	1	0.040	14.29	7
Summer							
	Spotted Sandpiper	ACMA1	93	1	0.032	100.00	1
	Cinnamon Teal	ANCY1	54	13	0.126	100.00	13

TABLE 3-7. (cont.)

Season	Common Name	Species Code	Habitat Type	Number of Observations	Observations/ Minute in Habitat ^a	Percent of Species/ Habitat	Total number of Observations for Species
Summer (cont.)							
	Blue-winged Teal	ANDI1	54	24	0.235	96.00	
	Blue-winged Teal	ANDI1	93	1	0.032	4.00	25
	Mallard	ANPL1	30	2	0.016	0.90	
	Mallard	ANPL1	54	207	2.029	93.67	
	Mallard	ANPL1	93	12	0.387	5.43	221
	Great Blue Heron	ARHE1	54	2	0.020	50.00	
	Great Blue Heron	ARHE1	93	1	0.032	25.00	
	Great Blue Heron	ARHE1	110	1	0.003	25.00	4
	Redhead	AYAM1	54	2	0.020	100.00	2
	American Bittern	BOLE1	93	1	0.032	100.00	1
	Canada Goose	BRCA1	54	9	0.088	100.00	9
	Killdeer	CHVO1	93	22	0.710	100.00	22
	American Coot	FUAM1	54	41	0.402	100.00	41
	Common Snipe	GAGA1	20	4	0.050	66.67	
	Common Snipe	GAGA1	30	2	0.016	33.33	6
	Ruddy Duck	OXJA1	54	1	0.010	100.00	1
	American White Pelican	PEER1	54	2	0.020	100.00	2
	Double-crested Cormorant	PHAU1	10	1	0.014	8.33	
	Double-crested Cormorant	PHAU1	54	9	0.088	75.00	
	Double-crested Cormorant	PHAU1	93	2	0.065	16.67	12
	Wilson's Phalarope	PHTR1	93	3	0.097	100.00	3
	Pied-billed Grebe	POPO1	54	51	0.500	100.00	51
Fall							
	Western Grebe	AEOC1	54	1	0.012	100.00	1
	Northern Shoveler	ANCL1	54	1	0.012	100.00	1
	Green-winged Teal	ANCR1	54	12	0.148	100.00	12
	Blue-winged Teal	ANDI1	54	21	0.259	84.00	
	Blue-winged Teal	ANDI1	93	4	0.222	16.00	25
	Mallard	ANPL1	20	1	0.011	1.00	
	Mallard	ANPL1	54	64	0.790	64.00	
	Mallard	ANPL1	93	35	1.944	35.00	100
	Gadwall	ANST1	54	64	0.790	100.00	64
	Lesser Scaup	AYAF1	54	2	0.025	100.00	2
	Ring-necked Duck	AYCO1	54	60	0.741	100.00	60
	Bufflehead	BUAL1	54	57	0.704	100.00	57
	Killdeer	CHVO1	93	28	1.556	96.55	
	Killdeer	CHVO1	110	1	0.003	3.45	29
	American Coot	FUAM1	54	18	0.222	100.00	18
	Common Merganser	MEME1	54	1	0.012	100.00	1
	Pied-billed Grebe	POPO1	54	14	0.173	100.00	14
	Virginia Rail	RALI1	20	1	0.011	100.00	1

^a Relative abundance value

TABLE 3-8. WATERFOWL AREA USE AT ROCKWATER ENVIRONMENTAL TECHNOLOGY SITE
IN 1997 BASED ON SITEWIDE SIGNIFICANT SPECIES SURVEYS

Common Name	Species Code	Admin Area	RF Grid N	RF Grid E	Group Size	Male	Female	Young	Un- Classd
Winter									
Mallard	ANPL1	BZ	2	T	2	1	1		
Bufflehead	BUAL1	BZ	2	T	1	1			
Common Goldeneye	BUCL1	BZ	2	T	1	1			
Mallard	ANPL1	BZ	3	R	1	1			
Redhead	AYAM1	BZ	3	R	48	33	15		
Common Goldeneye	BUCL1	BZ	3	R	3	1	2		
Mallard	ANPL1	BZ	7	P	8	4	4		
Common Goldeneye	BUCL1	BZ	7	P	5	3	2		
Green-winged Teal	ANCR1	BZ	10	O	7	6	1		
Mallard	ANPL1	BZ	10	O	19	11	8		
Canada Goose	BRCA1	BZ	12	L	2				2
Common Goldeneye	BUCL1	BZ	12	O	5				5
Spring									
Green-Winged Teal	ANCR1	BZ	2	T	12	7	5		
Cinnamon Teal	ANCY1	BZ	2	T	4	2	2		
Mallard	ANPL1	BZ	2	T	19	10	9		
Gadwall	ANST1	BZ	2	T	8	4	4		
Great Blue Heron	ARHE1	BZ	2	T	1				1
Lesser Scaup	AYAF1	BZ	2	T	20	10	10		
Ring-necked Duck	AYCO1	BZ	2	T	18	11	7		
Bufflehead	BUAL1	BZ	2	T	6	3	3		
American Coot	FUAM1	BZ	2	T	5				5
Common Merganser	MEME1	BZ	2	T	31		1		30
Ruddy Duck	OXJA1	BZ	2	T	4	1	3		
Pied-billed Grebe	POPO1	BZ	2	T	3				3
Blue-winged Teal	ANDI1	BZ	2	U	1		1		
Gadwall	ANST1	BZ	2	U	2	1	1		
Lesser Scaup	AYAF1	BZ	2	U	6	4	2		
Canada Goose	BRCA1	BZ	2	U	2	1	1		
American Coot	FUAM1	BZ	2	U	4				4
Common Merganser	MEME1	BZ	2	U	1	1			
Pied-billed Grebe	POPO1	BZ	2	U	3				3
Gadwall	ANST1	BZ	3	R	5	3	2		
Canada Goose	BRCA1	BZ	3	R	2	1	1		
Common Goldeneye	BUCL1	BZ	3	R	1		1		
American Coot	FUAM1	BZ	3	R	5				5
Mallard	ANPL1	BZ	3	S	1		1		
American Coot	FUAM1	BZ	4	R	6				6
Pied-billed Grebe	POPO1	BZ	4	R	6				6
Pied-billed Grebe	POPO1	BZ	4	S	1				1
Mallard	ANPL1	BZ	7	N	4	3	1		
Canada Goose	BRCA1	BZ	7	N	2	1	1		
Cinnamon Teal	ANCY1	BZ	7	P	2	1	1		

TABLE 3-8. (cont.)

Common Name	Species Code	Admin Area	RF Grid N	RF Grid E	Group Size	Male	Female	Young	Un- Classd
Spring (cont.)									
Mallard	ANPL1	BZ	7	P	2	1	1		
Canada Goose	BRCA1	BZ	7	P	2	1	1		
Bufflehead	BUAL1	BZ	7	P	4	1	3		
American Coot	FUAM1	BZ	7	P	2				2
Pied-billed Grebe	POPO1	BZ	7	P	6				6
Mallard	ANPL1	BZ	10	O	4	1	3		
Gadwall	ANST1	BZ	10	O	17				17
Canada Goose	BRCA1	BZ	10	O	2	1	1		
Pied-billed Grebe	POPO1	BZ	10	O	1				1
Mallard	ANPL1	BZ	10	P	3	1	2		
Gadwall	ANST1	BZ	10	P	4	2	2		
Great Blue Heron	ARHE1	BZ	10	P	1				1
Mallard	ANPL1	BZ	12	L	2	1	1		
Bufflehead	BUAL1	BZ	12	L	2	1	1		
Pied-billed Grebe	POPO1	BZ	12	L	1				1
Green-Winged Teal	ANCR1	BZ	12	N	4	4			
Mallard	ANPL1	BZ	12	N	2	1	1		
American Coot	FUAM1	BZ	12	N	3				3
Blue-winged Teal	ANDI1	BZ	12	O	2	1	1		
Mallard	ANPL1	BZ	12	O	8	4	3		1
Lesser Scaup	AYAF1	BZ	12	O	4	2	2		
Ring-necked Duck	AYCO1	BZ	12	O	4	2	2		
Greater Scaup	AYMA1	BZ	12	O	2	2			
American Coot	FUAM1	BZ	12	O	2				2
Pied-billed Grebe	POPO1	BZ	12	O	3				3
Green-Winged Teal	ANCR1	BZ	12	P	8	7	1		
Mallard	ANPL1	BZ	12	P	4	2	2		
Lesser Scaup	AYAF1	BZ	12	P	2	1	1		
Ring-necked Duck	AYCO1	BZ	12	P	3	2	1		
Canada Goose	BRCA1	BZ	12	P	3	1	1		1
Bufflehead	BUAL1	BZ	12	P	5	3	2		
American Wigeon	ANAM1	BZ	12	Q	2	1	1		
Green-Winged Teal	ANCR1	BZ	12	Q	2	1	1		
Mallard	ANPL1	BZ	12	Q	11	8	3		
Gadwall	ANST1	BZ	12	Q	2	1	1		
Lesser Scaup	AYAF1	BZ	12	Q	2	1	1		
Greater Scaup	AYMA1	BZ	12	Q	6	3	3		
Bufflehead	BUAL1	BZ	12	Q	8	4	4		
Mallard	ANPL1	BZ	13	H	4	3	1		
Mallard	ANPL1	BZ	13	L	2	1	1		
Pied-billed Grebe	POPO1	BZ	13	L	2				2
Summer									
Cinnamon Teal	ANCY1	BZ	2	T	1	1			
Blue-winged Teal	ANDI1	BZ	2	T	3				3

TABLE 3-8. (cont.)

Common Name	Species Code	Admin Area	RF Grid N	RF Grid E	Group Size	Male	Female	Young	Un- Classd
Summer (cont.)									
Mallard	ANPL1	BZ	2	T	15	5	4	6	
Redhead	AYAM1	BZ	2	T	2	1	1		
American Coot	FUAM1	BZ	2	T	10				10
Blue-winged Teal	ANDI1	BZ	2	U	1	1			
American Coot	FUAM1	BZ	3	R	10			3	7
Double-crested Cormorant	PHAU1	BZ	3	R	1				1
American Coot	FUAM1	BZ	4	R	5				5
Pied-billed Grebe	POPO1	BZ	4	R	11			7	4
Mallard	ANPL1	BZ	7	P	4	2	1		1
Double-crested Cormorant	PHAU1	BZ	7	P	1				1
Pied-billed Grebe	POPO1	BZ	7	P	2				2
Mallard	ANPL1	BZ	10	O	4	1			3
Great Blue Heron	ARHE1	BZ	10	O	1				1
Pied-billed Grebe	POPO1	BZ	10	O	2				2
Cinnamon Teal	ANCY1	BZ	10	P	2	1	1		
Mallard	ANPL1	BZ	10	P	2				2
Mallard	ANPL1	BZ	11	Q	1		1		
Canada Goose	BRCA1	BZ	11	Q	8	1	1	6	
Pied-billed Grebe	POPO1	BZ	11	Q	1				1
Blue-winged Teal	ANDI1	BZ	12	N	2	2			
Mallard	ANPL1	BZ	12	N	6		1	5	
Mallard	ANPL1	BZ	12	O	5				5
Canada Goose	BRCA1	BZ	12	O	1			1	
American Coot	FUAM1	BZ	12	O	6			2	4
Double-crested Cormorant	PHAU1	BZ	12	O	1				1
Pied-billed Grebe	POPO1	BZ	12	O	4			3	1
Mallard	ANPL1	BZ	12	P	3	1	2		
Great Blue Heron	ARHE1	BZ	12	P	1				1
Pied-billed Grebe	POPO1	BZ	12	P	1			1	
Mallard	ANPL1	BZ	12	Q	8	1	3	4	
Double-crested Cormorant	PHAU1	BZ	12	Q	4				4
Pied-billed Grebe	POPO1	BZ	12	Q	1				1
Mallard	ANPL1	BZ	13	Q	9	1	1	7	
Fall									
American Wigeon	ANAM1	BZ	2	T	1				1
Blue-winged Teal	ANDI1	BZ	2	T	35		7		28
Mallard	ANPL1	BZ	2	T	38	20	18		
Gadwall	ANST1	BZ	2	T	72	24	27		21
Ring-necked Duck	AYCO1	BZ	2	T	6	1	5		
Bufflehead	BUAL1	BZ	2	T	3	2	1		
Green-winged Teal	ANCR1	BZ	2	U	36	19	17		
American Coot	FUAM1	BZ	2	U	3				3
Pied-billed Grebe	POPO1	BZ	2	U	2				2

TABLE 3-8. (cont.)

Common Name	Species Code	Admin Area	RF Grid N	RF Grid E	Group Size	Male	Female	Young	Un- Classd
Fall (cont.)									
Mallard	ANPL1	BZ	3	R	6		2	4	
Gadwall	ANST1	BZ	3	R	2	1	1		
Ring-necked Duck	AYCO1	BZ	3	R	19	8	11		
Bufflehead	BUAL1	BZ	3	R	14	10	4		
Pied-billed Grebe	POPO1	BZ	3	R	2				2
American Coot	FUAM1	BZ	3	S	4				4
American Wigeon	ANAM1	BZ	4	R	75				75
Mallard	ANPL1	BZ	4	R	3		3		
Gadwall	ANST1	BZ	4	R	4	2	2		
Ring-necked Duck	AYCO1	BZ	4	R	4	3	1		
American Coot	FUAM1	BZ	4	R	5				5
Ruddy Duck	OXAJ1	BZ	4	R	3				3
Horned Grebe	POAU1	BZ	4	R	1				1
Bufflehead	BUAL1	BZ	7	P	5	1	4		
Common Goldeneye	BUCL1	BZ	7	P	2	1	1		
Pied-billed Grebe	POPO1	BZ	7	P	3				3
American Wigeon	ANAM1	BZ	10	O	5				5
Mallard	ANPL1	BZ	10	O	9		2	5	2
Green-winged Teal	ANCR1	BZ	10	P	4	4			
Blue-winged Teal	ANDI1	BZ	10	P	2			2	
Mallard	ANPL1	BZ	12	L	1		1		
Pied-billed Grebe	POPO1	BZ	12	L	1				1
American Wigeon	ANAM1	BZ	12	O	1	1			
Mallard	ANPL1	BZ	12	O	6	3	3		
Gadwall	ANST1	BZ	12	O	36	17	9		10
Pied-billed Grebe	POPO1	BZ	12	O	1				1
Common Goldeneye	BUCL1	BZ	12	P	3	1	2		
Northern Shoveler	ANCL1	BZ	12	Q	1	1			
Blue-winged Teal	ANDI1	BZ	12	Q	6		4	2	
Mallard	ANPL1	BZ	12	Q	29	15	14		
Bufflehead	BUAL1	BZ	12	Q	32	10	22		
Mallard	ANPL1	BZ	13	H	2		2		
Gadwall	ANST1	BZ	13	H	2	1	1		
Mallard	ANPL1	BZ	13	L	2				2
American Coot	FUAM1	BZ	13	L	1				1

**TABLE 3-9. RAPTOR RELATIVE ABUNDANCE BY HABITAT AT ROCKY FLATS
ENVIRONMENTAL TECHNOLOGY SITE IN 1997 BASED ON MULTI-SPECIES CENSUS SURVEYS**

Season	Common Name	Species Code	Habitat Type	Number of Observations	Observations/ Minute in Habitat ^a	Percent of Species/ Habitat	Total number of Observations for Species
Winter							
	Roughlegged Hawk	BULA1	322	1	0.120	100.00	1
	Great Horned Owl	BUVI1	110	14	0.045	93.33	
	Great Horned Owl	BUVI1	212	1	0.140	6.67	15
	American Kestrel	FASP1	20	1	0.008	50.00	
	American Kestrel	FASP1	110	1	0.003	50.00	2
	Bald Eagle	HALE1	110	1	0.003	100.00	1
Spring							
	Long-eared Owl	ASOT1	110	1	0.002	100.00	1
	Red-tailed Hawk	BUJA1	110	2	0.005	28.57	
	Red-tailed Hawk	BUJA1	230	1	0.005	14.29	
	Red-tailed Hawk	BUJA1	322	4	0.051	57.14	7
	Swainson's Hawk	BUSW1	110	2	0.005	100.00	2
	Great Horned Owl	BUVI1	110	12	0.029	80.00	
	Great Horned Owl	BUVI1	230	3	0.014	20.00	15
	American Kestrel	FASP1	30	3	0.030	75.00	
	American Kestrel	FASP1	212	1	0.007	25.00	4
Summer							
	Red-tailed Hawk	BUJA1	322	1	0.013	11.11	1
	Swainson's Hawk	BUSW1	10	1	0.014	11.11	
	Swainson's Hawk	BUSW1	30	1	0.008	11.11	
	Swainson's Hawk	BUSW1	110	7	0.021	77.78	9
	Great Horned Owl	BUVI1	110	5	0.015	83.33	
	Great Horned Owl	BUVI1	230	1	0.005	16.67	6
	Turkey Vulture	CAAU1	30	1	0.008	100.00	1
	American Kestrel	FASP1	10	1	0.014	14.29	
	American Kestrel	FASP1	110	4	0.012	57.14	
	American Kestrel	FASP1	230	1	0.005	14.29	
	American Kestrel	FASP1	322	1	0.013	14.29	7
Fall							
	Cooper's Hawk	ACCO1	110	1	0.003	100.00	1
	Red-tailed Hawk	BUJA1	54	1	0.012	20.00	
	Red-tailed Hawk	BUJA1	323	2	0.012	40.00	5
	Great Horned Owl	BUVI1	110	7	0.022	77.78	
	Great Horned Owl	BUVI1	520	2	0.077	22.22	9
	Northern Harrier	CICY1	230	1	0.005	100.00	1
	Prairie Falcon	FAME1	20	1	0.011	50.00	
	Prairie Falcon	FAME1	110	1	0.003	50.00	2
	American Kestrel	FASP1	110	4	0.013	100.00	4

^a Relative abundance value

**TABLE 3-10. RAPTOR AREA USE AT ROCKY MOUNTAINS ENVIRONMENTAL TECHNOLOGY SITE
IN 1997 BASED ON SITEWIDE SIGNIFICANT SPECIES SURVEYS**

Common Name	Species Code	Admin Area	RF Grid N	RF Grid E	Group Size	Male	Female	Young	Un- Classd
Winter									
Golden Eagle	AQCH1	BZ	3	L	1				1
Great Horned Owl	BUVI1	BZ	4	S	1				1
American Kestrel	FASP1	BZ	5	P	1				1
Red-tailed Hawk	BUJA1	BZ	7	E	1				1
Roughlegged Hawk	BULA1	BZ	7	K	1				1
Bald Eagle	HALE1	BZ	7	K	1				1
Golden Eagle	AQCH1	BZ	11	E	1				1
Great Horned Owl	BUVI1	BZ	11	M	9				9
Golden Eagle	AQCH1	BZ	12	S	1				1
Great Horned Owl	BUVI1	BZ	13	G	2				2
Roughlegged Hawk	BULA1	BZ	13	M	1				1
Roughlegged Hawk	BULA1	BZ	14	Q	1				1
Roughlegged Hawk	BULA1	BZ	15	G	1				1
Spring									
Red-tailed Hawk	BUJA1	BZ	2	K	1				1
Red-tailed Hawk	BUJA1	BZ	3	K	1				1
Great Horned Owl	BUVI1	BZ	4	S	1				1
Red-tailed Hawk	BUJA1	BZ	7	G	1				1
American Kestrel	FASP1	BZ	10	N	1				1
American Kestrel	FASP1	BZ	10	P	1	1			
Swainson's Hawk	BUSW1	BZ	11	M	1	1			
Swainson's Hawk	BUSW1	BZ	12	M	3			2	1
Swainson's Hawk	BUSW1	BZ	12	N	1		1		
Swainson's Hawk	BUSW1	BZ	12	Q	1				1
American Kestrel	FASP1	BZ	13	G	2	1	1		
Summer									
American Kestrel	FASP1	BZ	3	M	1				1
Turkey Vulture	CAAU1	BZ	7	N	1				1
Red-tailed Hawk	BUJA1	BZ	7	P	1				1
Red-tailed Hawk	BUJA1	BZ	8	O	1			1	
American Kestrel	FASP1	BZ	10	P	1				1
Swainson's Hawk	BUSW1	BZ	11	M	3		1	2	
American Kestrel	FASP1	BZ	11	P	1				1
Swainson's Hawk	BUSW1	BZ	12	M	2			2	
Great Horned Owl	BUVI1	BZ	13	G	1				1
American Kestrel	FASP1	BZ	13	H	1				1
Red-tailed Hawk	BUJA1	BZ	13	K	1				1

TABLE 3-10. (cont.)

Common Name	Species Code	Admin Area	RF Grid N	RF Grid E	Group Size	Male	Female	Young	Un- Classd
Fall									
American Kestrel	FASP1	BZ	2	F	1			1	
American Kestrel	FASP1	BZ	2	J	1			1	
Red-tailed Hawk	BUJA1	BZ	2	L	1				1
Red-tailed Hawk	BUJA1	BZ	2	O	1				1
Golden eagle	AQCH1	BZ	2	R	2	1	1		
Roughlegged Hawk	BULA1	BZ	2	U	1				1
Red-tailed Hawk	BUJA1	BZ	3	M	1				1
Red-tailed Hawk	BUJA1	BZ	3	R	1				1
Red-tailed Hawk	BUJA1	BZ	4	M	1				1
Osprey	PAHA1	BZ	4	R	1				1
American Kestrel	FASP1	BZ	6	F	1	1			
Red-tailed Hawk	BUJA1	BZ	7	H	1				1
Northern Harrier	CICY1	BZ	12	N	1		1		
Red-tailed Hawk	BUJA1	BZ	13	E	1			1	
Red-tailed Hawk	BUJA1	BZ	13	G	1			1	
Great Horned Owl	BUV11	BZ	13	G	3			2	1
American Kestrel	FASP1	BZ	13	L	1	1			
Northern Harrier	CICY1	BZ	16	M	1		1		

TABLE 3-11. FORTUITOUS OBSERVATIONS OF HERPTILES DURING 1997

Season	Common Name	Species Code	RF Grid N	RF Grid E	Hab Type	Group Size	Male	Female	Young	Un- Classd
Spring										
	Western Painted Turtle	CHPI1	13	G	93	2				2
	Prairie Rattlesnake	CRVI1	10	R	323	1				1
	Boreal Chorus Frog	PSTR1	10	D	10	3	3			
	Boreal Chorus Frog	PSTR1	8	P	49	5	5			
	Boreal Chorus Frog	PSTR1	12	O	54	5	5			
	Boreal Chorus Frog	PSTR1	12	P	54	3	3			
	Boreal Chorus Frog	PSTR1	12	L	54	10	10			
	Boreal Chorus Frog	PSTR1	17	L	41	1	1			
	Boreal Chorus Frog	PSTR1	7	M	30	10	10			
	Boreal Chorus Frog	PSTR1	13	G	46	4	4			
	Boreal Chorus Frog	PSTR1	11	E	46	8	8			
	Boreal Chorus Frog	PSTR1	11	D	46	5	5			
	Eastern Yellowbelly Racer	COCO1	5	L	323	1				1
	Eastern Yellowbelly Racer	COCO1	8	L	540	1				1
	Boreal Chorus Frog	PSTR1	11	O	43	2	2			
	Eastern Yellowbelly Racer	COCO1	13	L	323	2				2
	Prairie Rattlesnake	CRVI1	9	T	322	1				1
Summer										
	Prairie Rattlesnake	CRVI1	7	O	210	1				1
	Western Painted Turtle	CHPI1	13	H	93	1				1
	Western Painted Turtle	CHPI1	13	G	43	1				1
	Boreal Chorus Frog	PSTR1	12	O	54	8	8			
	Northern Leopard Frog	RAPI1	16	J	210	2				2
	Prairie Rattlesnake	CRVI1	4	N	20	1				1
	Prairie Rattlesnake	CRVI1	4	S	210	1				1
	Prairie Rattlesnake	CRVI1	6	R	210	1				1
	Prairie Rattlesnake	CRVI1	5	I	20	1				1
	Prairie Rattlesnake	CRVI1	8	L	540	2			1	1
	Prairie Rattlesnake	CRVI1	7	J	210	1				1
	Northern Leopard Frog	RAPI1	15	G	230	1				1
	Northern Leopard Frog	RAPI1	16	L	20	2				2
	Northern Leopard Frog	RAPI1	15	H	210	2				2
	Northern Leopard Frog	RAPI1	14	I	20	2				2
	Woodhouse's Toad	BUWO1	6	G	322	1				1
	Red-sided Garter Snake	THSI1	12	G	20	1				1

TABLE 3-16. (cont.)

Common Name	Species Code	Habitat Type	Number of Observations	Observations/ Minute in Habitat ^a	Percent of Species/ Habitat	Total number of Observations for Species
Summer (cont.)						
Barn Swallow	HIRU1	10	1	0.014	0.69	
Barn Swallow	HIRU1	20	7	0.088	4.86	
Barn Swallow	HIRU1	30	49	0.386	34.03	
Barn Swallow	HIRU1	54	10	0.098	6.94	
Barn Swallow	HIRU1	93	4	0.129	2.78	
Barn Swallow	HIRU1	110	36	0.110	25.00	
Barn Swallow	HIRU1	211	8	0.136	5.56	
Barn Swallow	HIRU1	212	16	0.174	11.11	
Barn Swallow	HIRU1	322	7	0.091	4.86	
Barn Swallow	HIRU1	324	6	0.176	4.17	144
Northern Oriole	ICGA1	30	1	0.008	1.61	
Northern Oriole	ICGA1	110	52	0.159	83.87	
Northern Oriole	ICGA1	211	1	0.017	1.61	
Northern Oriole	ICGA1	212	3	0.033	4.84	
Northern Oriole	ICGA1	230	3	0.014	4.84	
Northern Oriole	ICGA1	322	2	0.026	3.23	62
Yellow-breasted Chat	ICV11	110	1	0.003	12.50	
Yellow-breasted Chat	ICV11	230	7	0.033	87.50	8
Loggerhead Shrike	LALU1	230	1	0.005	100.00	11
Song Sparrow	MEME2	10	1	0.014	1.06	
Song Sparrow	MEME2	20	5	0.063	5.32	
Song Sparrow	MEME2	30	19	0.150	20.21	
Song Sparrow	MEME2	110	30	0.092	31.91	
Song Sparrow	MEME2	212	10	0.109	10.64	
Song Sparrow	MEME2	230	29	0.137	30.85	94
Brown-headed Cowbird	MOAT1	110	10	0.031	45.45	
Brown-headed Cowbird	MOAT1	211	4	0.068	18.18	
Brown-headed Cowbird	MOAT1	212	1	0.011	4.55	
Brown-headed Cowbird	MOAT1	230	7	0.033	31.82	22
Sage Thrasher	ORMO1	230	5	0.024	71.43	
Sage Thrasher	ORMO1	322	2	0.026	28.57	7
Black-capped Chickadee	PAAT1	110	5	0.015	31.25	
Black-capped Chickadee	PAAT1	230	11	0.052	68.75	16
Common Poorwill	PHNU1	323	2	0.016	100.00	2
Green-tailed Towhee	PICH1	230	12	0.057	100.00	12
Rufous-sided Towhee	PIER1	110	1	0.003	1.02	
Rufous-sided Towhee	PIER1	230	97	0.458	98.98	98
Black-billed Magpie	PIPI1	10	1	0.014	4.76	
Black-billed Magpie	PIPI1	110	7	0.021	33.33	
Black-billed Magpie	PIPI1	212	2	0.022	9.52	
Black-billed Magpie	PIPI1	230	11	0.052	52.38	21
Vesper Sparrow	POGR1	10	15	0.214	4.69	
Vesper Sparrow	POGR1	20	11	0.138	3.44	
Vesper Sparrow	POGR1	30	10	0.079	3.13	
Vesper Sparrow	POGR1	110	52	0.159	16.25	
Vesper Sparrow	POGR1	211	20	0.339	6.25	
Vesper Sparrow	POGR1	212	15	0.163	4.69	
Vesper Sparrow	POGR1	230	46	0.217	14.38	
Vesper Sparrow	POGR1	322	17	0.221	5.31	
Vesper Sparrow	POGR1	323	127	1.008	39.69	
Vesper Sparrow	POGR1	324	6	0.176	1.88	
Vesper Sparrow	POGR1	540	1	0.077	0.31	320
Golden-crowned Kinglet	RESA1	230	2	0.009	100.00	2
Eastern Phoebe	SAPH1	110	4	0.012	33.33	
Eastern Phoebe	SAPH1	211	1	0.017	8.33	
Eastern Phoebe	SAPH1	212	2	0.022	16.67	
Eastern Phoebe	SAPH1	230	1	0.005	8.33	
Eastern Phoebe	SAPH1	322	4	0.052	33.33	12

TABLE 3-16. (cont.)

Common Name	Species Code	Habitat Type	Number of Observations	Observations/ Minute in Habitat ^a	Percent of Species/ Habitat	Total number of Observations for Species
Summer (cont.)						
Say's Phoebe	SASA1	20	1	0.013	8.33	
Say's Phoebe	SASA1	30	1	0.008	8.33	
Say's Phoebe	SASA1	110	6	0.018	50.00	
Say's Phoebe	SASA1	212	1	0.011	8.33	
Say's Phoebe	SASA1	230	2	0.009	16.67	
Say's Phoebe	SASA1	323	1	0.008	8.33	12
Broad-tailed Hummingbird	SEPL1	230	3	0.014	75.00	
Broad-tailed Hummingbird	SEPL1	323	1	0.008	25.00	4
Chipping Sparrow	SPPA1	230	4	0.019	100.00	4
Western Meadowlark	STNE1	10	10	0.143	3.62	
Western Meadowlark	STNE1	20	17	0.213	6.16	
Western Meadowlark	STNE1	30	4	0.031	1.45	
Western Meadowlark	STNE1	54	1	0.010	0.36	
Western Meadowlark	STNE1	93	6	0.194	2.17	
Western Meadowlark	STNE1	110	104	0.318	37.68	
Western Meadowlark	STNE1	211	6	0.102	2.17	
Western Meadowlark	STNE1	212	17	0.185	6.16	
Western Meadowlark	STNE1	230	34	0.160	12.32	
Western Meadowlark	STNE1	322	25	0.325	9.06	
Western Meadowlark	STNE1	323	43	0.341	15.58	
Western Meadowlark	STNE1	324	9	0.265	3.26	276
European Starling	STVU1	10	2	0.029	0.90	
European Starling	STVU1	20	7	0.088	3.15	
European Starling	STVU1	30	10	0.079	4.50	
European Starling	STVU1	110	181	0.554	81.53	
European Starling	STVU1	211	1	0.017	0.45	
European Starling	STVU1	212	1	0.011	0.45	
European Starling	STVU1	322	19	0.247	8.56	
European Starling	STVU1	324	1	0.029	0.45	222
Tree Swallow	TAB11	54	1	0.010	100.00	1
Violet-green Swallow	TATH1	212	1	0.011	100.00	1
House Wren	TRAE1	30	1	0.008	10.00	
House Wren	TRAE1	110	3	0.009	30.00	
House Wren	TRAE1	212	2	0.022	20.00	
House Wren	TRAE1	230	4	0.019	40.00	10
American Robin	TUM11	20	4	0.050	6.56	
American Robin	TUM11	110	16	0.049	26.23	
American Robin	TUM11	212	2	0.022	3.28	
American Robin	TUM11	230	38	0.179	62.30	
American Robin	TUM11	324	1	0.029	1.64	61
Eastern Kingbird	TYTY1	110	5	0.015	100.00	5
Western Kingbird	TYVE1	20	1	0.013	16.67	
Western Kingbird	TYVE1	322	3	0.039	50.00	
Western Kingbird	TYVE1	323	2	0.016	33.33	6
Wilson's Warbler	WIPU1	30	1	0.008	100.00	1
Yellow-headed Blackbird	XAXA1	30	59	0.465	93.65	
Yellow-headed Blackbird	XAXA1	54	1	0.010	1.59	
Yellow-headed Blackbird	XAXA1	93	3	0.097	4.76	63
Mourning Dove	ZEMA1	10	1	0.014	1.03	
Mourning Dove	ZEMA1	20	3	0.038	3.09	
Mourning Dove	ZEMA1	30	4	0.031	4.12	
Mourning Dove	ZEMA1	54	1	0.010	1.03	
Mourning Dove	ZEMA1	110	68	0.208	70.10	
Mourning Dove	ZEMA1	212	12	0.130	12.37	
Mourning Dove	ZEMA1	230	2	0.009	2.06	
Mourning Dove	ZEMA1	322	1	0.013	1.03	
Mourning Dove	ZEMA1	324	5	0.147	5.15	97

TABLE 3-16. (cont.)

Common Name	Species Code	Habitat Type	Number of Observations	Observations/ Minute in Habitat ^a	Percent of Species/ Habitat	Total number of Observations for Species
Fall						
Red-winged Blackbird	AGPH1	30	4	0.062	21.05	
Red-winged Blackbird	AGPH1	93	6	0.333	31.58	
Red-winged Blackbird	AGPH1	110	1	0.003	5.26	
Red-winged Blackbird	AGPH1	212	7	0.081	36.84	
Red-winged Blackbird	AGPH1	230	1	0.005	5.26	19
Grasshopper Sparrow	AMSA1	10	2	0.032	28.57	
Grasshopper Sparrow	AMSA1	20	1	0.011	14.29	
Grasshopper Sparrow	AMSA1	110	1	0.003	14.29	
Grasshopper Sparrow	AMSA1	211	1	0.018	14.29	
Grasshopper Sparrow	AMSA1	323	2	0.012	28.57	7
House Finch	CAME2	20	2	0.022	1.27	
House Finch	CAME2	54	5	0.062	3.16	
House Finch	CAME2	110	66	0.211	41.77	
House Finch	CAME2	211	5	0.091	3.16	
House Finch	CAME2	212	25	0.291	15.82	
House Finch	CAME2	230	35	0.192	22.15	
House Finch	CAME2	322	4	0.065	2.53	
House Finch	CAME2	324	1	0.063	0.63	
House Finch	CAME2	540	15	0.577	9.49	158
American Goldfinch	CATR1	20	6	0.065	24.00	
American Goldfinch	CATR1	110	9	0.029	36.00	
American Goldfinch	CATR1	212	3	0.035	12.00	
American Goldfinch	CATR1	230	7	0.038	28.00	25
Northern Flicker	COAU1	110	16	0.051	84.21	
Northern Flicker	COAU1	212	1	0.012	5.26	
Northern Flicker	COAU1	230	2	0.011	10.53	19
Common Raven	COCO1	110	1	0.003	50.00	
Common Raven	COCO1	230	1	0.005	50.00	2
Yellow-rumped Warbler	DECO1	93	1	0.056	14.29	
Yellow-rumped Warbler	DECO1	110	6	0.019	85.71	7
Yellow Warbler	DEPE1	212	1	0.012	100.00	1
Horned Lark	ERAL1	110	2	0.006	33.33	
Horned Lark	ERAL1	230	2	0.011	33.33	
Horned Lark	ERAL1	323	2	0.012	33.33	6
Common Yellowthroat	GETR1	110	1	0.003	100.00	1
Cliff Swallow	HIPY1	54	4	0.049	30.77	
Cliff Swallow	HIPY1	110	9	0.029	69.23	13
Dark-eyed Junco	JUHY1	110	1	0.003	100.00	1
Song Sparrow	MEME2	10	1	0.016	1.43	
Song Sparrow	MEME2	20	9	0.097	12.86	
Song Sparrow	MEME2	30	11	0.169	15.71	
Song Sparrow	MEME2	110	24	0.077	34.29	
Song Sparrow	MEME2	211	4	0.073	5.71	
Song Sparrow	MEME2	212	8	0.093	11.43	
Song Sparrow	MEME2	230	13	0.071	18.57	70
Black-capped Chickadee	PAAT1	110	4	0.013	33.33	
Black-capped Chickadee	PAAT1	230	8	0.044	66.67	12
Green-tailed Towhee	PICH1	230	1	0.005	100.00	1
Rufous-sided Towhee	PIER1	110	4	0.013	6.45	
Rufous-sided Towhee	PIER1	212	2	0.023	3.23	
Rufous-sided Towhee	PIER1	230	46	0.253	74.19	52
Black-billed Magpie	PIPI1	10	1	0.016	1.19	
Black-billed Magpie	PIPI1	20	1	0.011	1.19	
Black-billed Magpie	PIPI1	30	5	0.077	5.95	
Black-billed Magpie	PIPI1	110	55	0.176	65.48	
Black-billed Magpie	PIPI1	212	10	0.116	11.90	
Black-billed Magpie	PIPI1	230	11	0.060	13.10	
Black-billed Magpie	PIPI1	323	1	0.006	1.19	84
Hairy Woodpecker	PIVI1	110	1	0.003	100.00	1

TABLE 3-16. (cont.)

Common Name	Species Code	Habitat Type	Number of Observations	Observations/ Minute in Habitat ^a	Percent of Species/ Habitat	Total number of Observations for Species
Fall (cont.)						
Vesper Sparrow	POGR1	10	18	0.286	23.08	
Vesper Sparrow	POGR1	20	3	0.032	3.85	
Vesper Sparrow	POGR1	30	3	0.046	3.85	
Vesper Sparrow	POGR1	54	1	0.012	1.28	
Vesper Sparrow	POGR1	93	1	0.056	1.28	
Vesper Sparrow	POGR1	110	13	0.042	16.67	
Vesper Sparrow	POGR1	211	3	0.055	3.85	
Vesper Sparrow	POGR1	212	2	0.023	2.56	
Vesper Sparrow	POGR1	230	15	0.082	19.23	
Vesper Sparrow	POGR1	322	5	0.081	6.41	
Vesper Sparrow	POGR1	323	13	0.081	16.67	78
Golden-crowned Kinglet	RESA1	230	2	0.011	100.00	2
Sage Thrasher	SAOB1	230	1	0.005	50.00	
Sage Thrasher	SAOB1	323	1	0.006	50.00	2
Say's Phoebe	SASA1	110	1	0.003	33.33	
Say's Phoebe	SASA1	212	1	0.012	33.33	
Say's Phoebe	SASA1	322	1	0.016	33.33	3
American Tree Sparrow	SPAR1	20	3	0.032	6.00	
American Tree Sparrow	SPAR1	30	1	0.015	2.00	
American Tree Sparrow	SPAR1	110	37	0.118	74.00	
American Tree Sparrow	SPAR1	230	5	0.027	10.00	
American Tree Sparrow	SPAR1	322	4	0.065	8.00	50
Chipping Sparrow	SPPA1	30	3	0.046	12.50	
Chipping Sparrow	SPPA1	211	6	0.109	25.00	
Chipping Sparrow	SPPA1	230	15	0.082	62.50	24
Western Meadowlark	STNE1	10	12	0.190	7.41	
Western Meadowlark	STNE1	20	9	0.097	5.56	
Western Meadowlark	STNE1	30	8	0.123	4.94	
Western Meadowlark	STNE1	93	14	0.778	8.64	
Western Meadowlark	STNE1	110	44	0.141	27.16	
Western Meadowlark	STNE1	211	4	0.073	2.47	
Western Meadowlark	STNE1	212	28	0.326	17.28	
Western Meadowlark	STNE1	322	12	0.194	7.41	
Western Meadowlark	STNE1	323	17	0.106	10.49	
Western Meadowlark	STNE1	324	12	0.750	7.41	
Western Meadowlark	STNE1	530	2	0.077	1.23	162
European Starling	STVU1	110	41	0.131	97.62	
European Starling	STVU1	230	1	0.005	2.38	42
House Wren	TRAE1	110	4	0.013	80.00	
House Wren	TRAE1	530	1	0.038	20.00	5
American Robin	TUMI1	110	4	0.013	44.44	
American Robin	TUMI1	212	1	0.012	11.11	
American Robin	TUMI1	230	2	0.011	22.22	
American Robin	TUMI1	322	1	0.016	11.11	
American Robin	TUMI1	324	1	0.063	11.11	9
Western Kingbird	TYVE1	110	1	0.003	50.00	
Western Kingbird	TYVE1	322	1	0.016	50.00	2
Mourning Dove	ZEMA1	110	3	0.010	60.00	
Mourning Dove	ZEMA1	212	2	0.023	40.00	5
White-crowned Sparrow	ZOLE1	30	4	0.062	13.33	
White-crowned Sparrow	ZOLE1	110	8	0.026	26.67	
White-crowned Sparrow	ZOLE1	212	9	0.105	30.00	
White-crowned Sparrow	ZOLE1	230	8	0.044	26.67	
White-crowned Sparrow	ZOLE1	540	1	0.038	3.33	30

^a Relative abundance value

TABLE 3-17. SITEWIDE MIGRATORY BIRD RELATIVE ABUNDANCE SUMMARY FOR 1997 BASED ON MULTI-SPECIES CENSUS SURVEYS

Winter		Spring		Summer		Fall		Annual			
Species	Observations per Minute	Species	Observations per Minute	Species	Observations per Minute	Species	Observations per Minute	Species	Observations per Minute	Species	Observations per Minute
European Starling	0.138	Cliff Swallow	0.264	House Finch	0.610	Western Meadowlark	0.133	House Finch	0.2109	Common Raven	0.0029
American Tree Sparrow	0.049	Red-winged Blackbird	0.172	Red-winged Blackbird	0.447	House Finch	0.128	Red-winged Blackbird	0.1707	House Wren	0.0029
Black-billed Magpie	0.040	Western Meadowlark	0.151	Vesper Sparrow	0.235	Black-billed Magpie	0.068	Western Meadowlark	0.1287	Yellow-breasted Chat	0.0027
American Robin	0.040	European Starling	0.078	Western Meadowlark	0.203	Vesper Sparrow	0.063	Cliff Swallow	0.1125	Dark-eyed Junco	0.0025
Black-capped Chickadee	0.030	House Finch	0.076	European Starling	0.163	Song Sparrow	0.057	European Starling	0.1026	Eastern Phoebe	0.0025
Horned Lark	0.025	Song Sparrow	0.062	American Goldfinch	0.126	Rufous-sided Towhee	0.043	Vesper Sparrow	0.0898	Mountain Bluebird	0.0023
Northern Flicker	0.018	Barn Swallow	0.053	Cliff Swallow	0.123	American Tree Sparrow	0.041	Song Sparrow	0.0511	Tree Swallow	0.0021
Song Sparrow	0.007	Vesper Sparrow	0.048	Barn Swallow	0.106	European Starling	0.034	American Goldfinch	0.0504	Lincoln's Sparrow	0.0015
Common Raven	0.006	American Goldfinch	0.044	Rufous-sided Towhee	0.072	White-crowned Sparrow	0.025	Barn Swallow	0.0431	Lark Sparrow	0.0013
Western Meadowlark	0.003	American Robin	0.033	Mourning Dove	0.071	American Goldfinch	0.020	Rufous-sided Towhee	0.0311	Sage Thrasher	0.0013
Snow Bunting	0.002	Mourning Dove	0.032	Song Sparrow	0.069	Chipping Sparrow	0.020	Black-billed Magpie	0.0311	Eastern Kingbird	0.0010
Red-winged Blackbird	0.001	Northern Oriole	0.025	Brewer's Blackbird	0.065	Red-winged Blackbird	0.016	Mourning Dove	0.0290	Western Wood-Pewee	0.0008
House Finch	0.001	Black-billed Magpie	0.021	Yellow-headed Blackbird	0.046	Northern Flicker	0.016	American Robin	0.0271	Golden-crowned Kinglet	0.0008
Downy Woodpecker	0.001	Violet-green Swallow	0.019	Northern Oriole	0.046	Cliff Swallow	0.011	American Tree Sparrow	0.0200	Broad-tailed Hummingbird	0.0008
		Yellow Warbler	0.015	Grasshopper Sparrow	0.040	Black-capped Chickadee	0.010	Northern Oriole	0.0191	Rock Dove	0.0004
		Rufous-sided Towhee	0.015	Lark Bunting	0.040	American Robin	0.007	Brewer's Blackbird	0.0185	Townsend's Solitaire	0.0004
		Yellow-headed Blackbird	0.015	Blue Grosbeak	0.029	Grasshopper Sparrow	0.006	Yellow-headed Blackbird	0.0164	Common Poorwill	0.0004
		Yellow-rumped Warbler	0.014	American Robin	0.028	Yellow-rumped Warbler	0.006	Grasshopper Sparrow	0.0156	Snow Bunting	0.0004
		White-crowned Sparrow	0.014	Common Yellowthroat	0.027	Horned Lark	0.005	Black-capped Chickadee	0.0134	Rock Wren	0.0004
		Grasshopper Sparrow	0.013	Lesser Goldfinch	0.026	House Wren	0.004	Lark Bunting	0.0113	Common Nighthawk	0.0002
		Brown-headed Cowbird	0.013	Yellow Warbler	0.018	Mourning Dove	0.004	Common Yellowthroat	0.0109	Gray Catbird	0.0002
		Common Yellowthroat	0.012	Brown-headed Cowbird	0.016	Say's Phoebe	0.002	White-crowned Sparrow	0.0097	Loggerhead Shrike	0.0002
		Western Kingbird	0.009	Black-capped Chickadee	0.012	Common Raven	0.002	Yellow Warbler	0.0095	Downy Woodpecker	0.0002
		Dark-eyed Junco	0.008	Green-tailed Towhee	0.009	Golden-crowned Kinglet	0.002	Northern Flicker	0.0093	Hairy Woodpecker	0.0002
		Mountain Bluebird	0.008	Eastern Phoebe	0.009	Rock Wren	0.002	Blue Grosbeak	0.0082	Common Grackle	0.0002
		Tree Swallow	0.006	Say's Phoebe	0.009	Western Kingbird	0.002	Brown-headed Cowbird	0.0080	Wilson's Warbler	0.0002
		Northern Flicker	0.006	House Wren	0.007	Yellow Warbler	0.001	Horned Lark	0.0078		
		Black-capped Chickadee	0.006	Yellow-breasted Chat	0.006	Common Yellowthroat	0.001	Lesser Goldfinch	0.0074		
		Brewer's Blackbird	0.005	Lark Sparrow	0.005	Dark-eyed Junco	0.001	Yellow-rumped Warbler	0.0057		
		Lincoln's Sparrow	0.005	Horned Lark	0.005	Green-tailed Towhee	0.001	Violet-green Swallow	0.0057		
		Yellow-breasted Chat	0.004	Sage Thrasher	0.005	Hairy Woodpecker	0.001	Chipping Sparrow	0.0053		
		Common Raven	0.003	Western Kingbird	0.004			Western Kingbird	0.0042		
		Green-tailed Towhee	0.003	Eastern Kingbird	0.004			Green-tailed Towhee	0.0034		
		Lark Bunting	0.003	Broad-tailed Hummingbird	0.003			Say's Phoebe	0.0034		
		Blue Grosbeak	0.003	Chipping Sparrow	0.003						
		Lesser Goldfinch	0.002	Black-billed Magpie	0.002						
		Western Wood-Pewee	0.002	Rock Dove	0.001						
		Say's Phoebe	0.002	Common Poorwill	0.001						
		Townsend's Solitaire	0.001	Golden-crowned Kinglet	0.001						
		Gray Catbird	0.001	Common Nighthawk	0.001						
		Common Grackle	0.001	Northern Flicker	0.001						
		Eastern Phoebe	0.001	Common Raven	0.001						
				Western Wood-Pewee	0.001						
				Yellow-rumped Warbler	0.001						
				Loggerhead Shrike	0.001						
				Tree Swallow	0.001						
				Violet-green Swallow	0.001						
				Wilson's Warbler	0.001						

**TABLE 3-18. SUMMARY OF DIVERSITY INDEX^a FOR THE BREEDING SEASON
(MONTH OF JUNE) FOR 1991, 1993-1997**

Year	Habitat							All Habitats Combined
	Wetland	Riparian Woodland	Amorpha Shrubland	Tall Upland Shrubland	Mesic Grassland	Xeric Grassland	Reclaimed Grassland	
1991	0.70	0.89	0.87	0.88	0.67	0.81	0.80	0.88
1993	0.66	0.90	0.91	0.86	0.81	0.78	0.82	0.87
1994	0.63	0.93	0.92	0.90	0.88	0.81	0.81	0.91
1995	0.65	0.94	0.91	0.91	0.86	0.79	0.81	0.92
1996	0.63	0.90	0.87	0.91	0.87	0.76	0.83	0.92
1997	0.62	0.90	0.89	0.92	0.80	0.80	0.81	0.91

^a Diversity indices are based on surveys during the month of June.

TABLE 3-19. BIRD SPECIES RICHNESS BY HABITAT DURING JUNE (1991, 1993-1997)

Habitat	1991/92	1993/94	1994/95	1995/96	1996/97	1997/98
Wetland	24	30	29	25	24	21
Riparian Woodland Complex	28	28	31	33	33	31
Riparian Shrubland - Amorpha	16	19	16	18	13	17
Tall Upland Shrub	19	26	33	34	28	33
Mesic Mixed Grassland	14	12	24	20	17	17
Xeric Mixed Grassland	16	15	24	17	15	16
Reclaimed Mixed Grassland	12	19	18	18	16	14
All Habitats	45	48	50	47	48	49
NeoTropical Migrants	33	35	33	30	28	29
Number of Birds Observed	1,848	1,920	2,670	2,144	2,181	2,554

Note: Selected flyover data were removed from this analysis.

**TABLE 3-21. BREEDING SEASON DENSITIES OF SELECTED BIRD SPECIES
ACROSS ALL HABITATS SITEWIDE (1991, 1993-1997)**

Summary	1991	1993	1994	1995	1996	1997
Red-winged Blackbird	1.35	2.18	1.48	1.73	2.08	2.53
Western Meadowlark	0.64	0.97	0.79	0.69	1.00	1.27
Vesper Sparrow	0.66	0.67	0.81	0.68	0.79	1.03
House Finch	0.79	0.53	0.60	0.64	0.68	1.36
European Starling	0.75	0.07	0.40	0.55	1.02	0.84
Song Sparrow	0.36	0.22	0.62	0.67	0.60	0.66
Northern Oriole	0.33	0.39	0.56	0.48	0.43	0.88
American Goldfinch	0.43	0.11	0.50	0.57	0.49	0.73
Brewer's Blackbird	0.07	1.06	0.56	0.57	0.16	0.14
Grasshopper Sparrow	0.10	0.43	0.35	0.29	0.64	0.46
Mourning Dove	0.28	0.22	0.28	0.53	0.43	0.26
Rufous-sided Towhee	0.12	0.19	0.26	0.34	0.42	0.50
Brown-headed Cowbird	0.10	0.02	0.23	0.11	0.17	0.36
Yellow Warbler	0.19	0.29	0.01	0.08	0.14	0.26
Common Yellowthroat	0.07	0.16	0.12	0.34	0.10	0.16
Black-billed Magpie	0.04	0.05	0.13	0.11	0.10	0.19
Common Snipe	0.09	0.09	0.10	0.06	0.05	0.09
Western Kingbird	0.14	0.01	0.10	0.11	0.04	0.06
Blue Grosbeak	0.04	0.14	0.07	0.05	0.04	0.12
Yellow-breasted Chat	0.04	0.02	0.01	0.02	0.04	0.05
Black-capped Chickadee	--	--	0.01	0.08	0.01	0.01
Density: All species combined	5.30	6.33	6.73	6.85	7.86	10.03

Note: Densities are individuals per hectare during the month of June.

TABLE 3-22. DENSITIES^a OF ALL BREEDING BIRDS BY HABITAT (1991, 1993-1997)

Habitat	1991		1993		1994		1995		1996		1997	
	Density	Std.Dev.	Density	Std.Dev.	Density	Std.Dev.	Density	Std.Dev.	Density	Std.Dev.	Density	Std.Dev.
Wetlands	7.29	1.3	13.02	3.0	7.94	1.7	8.98	2.7	11.12	1.9	13.36	3.4
Riparian Woodland Complex	17.93	6.5	10.05	1.3	12.43	4.9	11.54	4.8	25.55	7.8	25.80	7.5
Riparian Shrublands - Amorpha	6.28	1.1	12.38	6.5	11.70	2.7	12.44	6.0	7.59	4.6	15.18	8.6
Upland Shrublands	3.49	1.6	9.09	3.8	10.99	2.1	11.09	5.6	8.67	5.1	17.22	2.8
Mesic Mixed Grasslands	3.21	1.5	2.73	0.8	6.11	2.2	6.94	1.0	3.68	1.3	5.55	0.6
Xeric Mixed Grasslands	2.23	0.6	2.54	0.8	2.75	1.0	3.00	0.9	4.43	0.9	3.45	0.7
Reclaimed Grasslands	3.21	0.9	3.83	0.7	4.37	0.6	3.17	0.8	3.57	1.9	2.83	1.2

^a Densities are individuals per hectare during the month of June.

TABLE 3-23. DENSITIES^a OF SELECTED BIRD SPECIES BY HABITAT (1991, 1993-1997)

Summary	1991		1993		1994		1995		1996		1997	
	Density	Std.Dev.	Density	Std.Dev.	Density	Std.Dev.	Density	Std.Dev.	Density	Std.Dev.	Density	Std.Dev.
Wetlands												
Red-winged Blackbird	6.37	2.0	9.98	4.0	6.72	1.8	7.48	2.8	9.46	3.9	11.76	2.6
Common Snipe	0.50	0.9	0.70	0.6	0.58	0.4	0.48	0.1	0.22	0.2	0.31	0.4
Song Sparrow	0.30	0.4	0.23	0.2	0.47	0.1	0.84	0.3	0.38	0.3	0.83	0.2
Common Yellowthroat	0.25	0.1	0.67	0.5	0.51	0.3	1.05	0.4	0.47	0.2	0.46	0.4
Riparian Woodland Complex												
House Finch	5.55	5.0	2.86	1.2	3.72	2.2	0.96	1.3	4.61	2.8	7.97	7.8
European Starling	4.78	4.2	0.44	0.9	2.61	3.2	2.35	2.7	7.02	8.4	4.73	3.0
Northern Oriole	2.21	0.9	1.68	0.6	2.94	0.9	2.19	1.2	2.55	0.8	4.46	1.3
American Goldfinch	1.79	1.1	1.79	0.4	2.11	1.5	1.44	0.4	2.25	1.9	3.34	1.3
Yellow Warbler	1.22	1.0	1.89	1.8	0.25	0.3	0.53	0.8	1.05	0.8	1.39	1.1
Brown-headed Cowbird	0.22	0.4	0.04	0.1	0.99	0.7	0.53	0.3	1.33	0.9	1.33	1.3
Blue Grosbeak	0.18	0.3	0.56	0.2	0.67	0.9	0.25	0.3	0.33	0.3	0.52	0.9
Riparian Shrublands - <i>Amorpha</i>												
Vesper Sparrow	1.15	0.6	2.78	4.5	1.67	2.5	0.96	0.8	1.81	2.3	1.97	1.1
Mourning Dove	1.33	0.6	2.33	0.6	2.19	1.0	1.28	1.5	1.33	1.5	1.25	1.0
European Starling	1.06	2.7	-	-	1.07	1.0	1.75	2.1	1.00	2.0	1.12	0.9
Northern Oriole	0.53	1.0	3.67	3.1	2.89	1.4	1.84	0.7	2.00	1.4	2.33	1.9
Brewer's Blackbird	0.15	1.1	5.33	4.5	0.50	1.0	3.56	5.1	-	-	-	-
Upland Shrublands												
Song Sparrow	1.48	2.2	0.63	0.4	2.58	0.9	2.51	1.3	2.17	1.0	1.88	0.3
Rufous-sided Towhee	1.46	0.7	1.60	0.5	2.33	0.5	2.96	2.4	3.67	1.6	4.02	1.4
Brown-headed Cowbird	0.27	0.5	0.06	0.3	0.62	0.2	0.51	0.5	0.45	0.5	1.38	1.3
Black-billed Magpie	0.20	0.1	0.35	0.5	1.28	0.5	0.96	0.8	0.45	0.1	2.03	2.0
Yellow-breasted Chat	0.32	0.4	0.17	0.3	0.13	0.3	0.17	0.2	0.39	0.2	0.39	0.1
Black-capped Chickadee	-	-	-	-	0.13	0.3	0.64	0.5	0.08	0.2	0.10	0.2
Mesic Mixed Grasslands												
Vesper Sparrow	1.44	0.9	0.73	0.0	1.14	0.7	0.85	0.4	0.62	0.5	1.22	0.6
House Finch	1.32	1.5	0.35	0.4	1.56	1.2	3.06	5.6	0.24	0.2	1.38	1.4
Western Meadowlark	0.74	0.3	0.88	0.2	1.14	0.4	1.26	0.8	1.16	0.4	2.04	0.7
Western Kingbird	0.33	0.6	-	-	0.13	0.3	0.07	0.2	0.06	0.1	0.05	0.1
Grasshopper Sparrow	-	-	0.38	0.3	0.29	0.2	0.32	0.3	0.62	0.2	0.17	0.1
Xeric Mixed Grasslands												
Vesper Sparrow	0.85	0.5	1.09	0.9	1.15	0.7	1.32	0.5	1.59	0.6	1.97	0.7
Western Meadowlark	0.48	0.0	0.72	0.2	0.69	0.3	0.66	0.1	1.10	0.2	0.94	0.1
Grasshopper Sparrow	0.28	0.3	0.70	0.2	0.72	0.3	0.53	0.4	1.61	0.5	0.92	0.4
Reclaimed Grasslands												
Western Meadowlark	1.16	0.7	0.74	0.2	1.26	0.3	0.85	0.2	0.92	0.4	0.87	0.3
Vesper Sparrow	1.08	0.3	0.91	0.5	0.98	0.2	1.02	0.5	0.99	0.6	0.94	1.0
Grasshopper Sparrow	0.25	0.1	0.91	0.3	0.68	0.3	0.71	0.3	0.96	0.5	1.00	0.4

^a Densities are individuals per hectare during the month of June.

TABLE 3-11. (cont.)

Season	Common Name	Species Code	RF Grid N	RF Grid E	Hab Type	Group Size	Male	Female	Young	Un- Classd
Summer (cont.)										
	Wandering Garter Snake	THLE1	16	H	331	1				1
	Eastern Short-horned Lizard	PHDO1	3	K	331	1				1
	Northern Leopard Frog	RAPI1	11	J	324	1				1
	Northern Leopard Frog	RAPI1	13	H	110	2				2
	Northern Leopard Frog	RAPI1	13	H	210	1				1
	Northern Leopard Frog	RAPI1	17	K	110	2				2
	Northern Leopard Frog	RAPI1	16	K	210	2				2
	Northern Leopard Frog	RAPI1	15	J	110	2				2
	Northern Leopard Frog	RAPI1	15	I	110	1				1
	Northern Leopard Frog	RAPI1	15	K	30	1				1
Fall										
	Prairie Rattlesnake	CRVI1	6	R	210	1				1
	Western Painted Turtle	CHPI1	14	T	10	1				1

**TABLE 3-12. HERPTILE RELATIVE ABUNDANCE BY HABITAT AT
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
IN 1997 BASED ON MULTI-SPECIES SURVEYS**

Common Name	Species Code	Habitat Type	Number of Observations	Observations/ Minute in Habitat ^a	Percent of Species/ Habitat	Total number of Observations for Species
Spring						
Western Painted Turtle	CHPI1	30	1	0.010	33.33	
Western Painted Turtle	CHPI1	54	2	0.210	66.67	3
Boreal Chorus Frog	PSTR1	20	4	0.023	3.10	
Boreal Chorus Frog	PSTR1	30	6	0.061	4.65	
Boreal Chorus Frog	PSTR1	43	24	2.182	18.60	
Boreal Chorus Frog	PSTR1	51	5	0.455	3.88	
Boreal Chorus Frog	PSTR1	54	83	0.014	64.34	
Boreal Chorus Frog	PSTR1	110	7	0.017	5.43	129
Fall						
Western Painted Turtle	CHPI1	54	17	0.210	100.00	17

^a Relative abundance value

**TABLE 3-13. HERPTILE AREA USE AT ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE IN 1997
BASED ON SITEWIDE SIGNIFICANT SPECIES SURVEYS**

Common Name	Species Code	Admin Area	RF Grid N	RF Grid E	Group Size	Male	Female	Young	Un- Classd
Spring									
Boreal Chorus Frog	PSTR1	BZ	7	L	4	4			
Boreal Chorus Frog	PSTR1	BZ	10	O	8	8			
Boreal Chorus Frog	PSTR1	BZ	11	N	10	10			
Boreal Chorus Frog	PSTR1	BZ	12	L	3	3			
Boreal Chorus Frog	PSTR1	BZ	12	N	10	10			
Boreal Chorus Frog	PSTR1	BZ	12	O	5	5			
Boreal Chorus Frog	PSTR1	BZ	12	Q	15	15			
Boreal Chorus Frog	PSTR1	BZ	15	J	6	4			2
Summer									
Western Painted Turtle	CHPI1	BZ	10	O	2				2
Fall									
Bullsnake	PIME1	BZ	7	N	1				1
Prairie Rattlesnake	CRVI1	BZ	9	L	1				1

**TABLE 3-14. 1997 SEARCH LIST FOR SPECIAL-CONCERN SPECIES AT
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE**

Federal Endangered Species Known to Occur at Rocky Flats

Birds
American Peregrine Falcon (*Falco peregrinus*) 1,2

Federal Threatened Species Known to Occur at Rocky Flats

Birds
Bald Eagle (*Haliaeetus leucocephalus*) 3

Federal Proposed Species Known to Occur at Rocky Flats

Mammals
Preble's Meadow Jumping Mouse (*Zapus hudsonius preblei*) 4,5,6,7

Federal Special-Concern Species Known to Occur at Rocky Flats

Reptiles
Eastern Short Horned Lizard (*Phrynosoma douglassii brevirostra*) 4,5

Birds
Northern Goshawk (*Accipiter gentilis*) 5,8
Baird's Sparrow (*Ammodramus bairdii*) 5,8
Western Burrowing Owl (*Athene cunicularia hypugea*) 4,5
Ferruginous Hawk (*Buteo regalis*) 4,5,7
Black Swift (*Cypseloides niger*) 5,8
Loggerhead Shrike (*Lanius ludovicianus*) 4,5
White-faced Ibis (*Plegadis chihi*) 5

Mammals
Small-footed Myotis (*Myotis subulatus* = *M. ciliolabrum*) 5,8

Colorado Species of Special Concern Known to Occur at Rocky Flats

Amphibians
Northern Leopard Frog (*Rana pipiens*) 7

Birds
Long-billed Curlew (*Numenius americanus*) 6,7
Greater Sandhill Crane (*Grus canadensis tibida*) 6,2
American White Pelican (*Pelecanus erythrorhynchos*) 4,7

Federal Endangered Species with Potential Habitat at Rocky Flats

Birds
Whooping Crane (*Grus americana*)
Least Tern (*Sterna antillarum*)
Piping Plover (*Charadrius melodus*)
Southwestern Willow Flycatcher (*Empidonax traillii extimus*) 9

Mammals
Black-footed Ferret (*Mustela nigripes*) 10

Federal Threatened Species with Potential Habitat at Rocky Flats

Plants
Ute Ladies'-tresses (*Spiranthes diluvialis*) 11

Insects
Pawnee Montane Skipper (*Hesperia leonardus montana*)

Federal Proposed Species with Potential Habitat at Rocky Flats

Plants
Colorado Butterfly Plant (*Gaura neomexicana* var. *coloradensis*) 12

Birds
Mountain Plover (*Charadrius montanus*) 13

TABLE 3-14. (cont.)**Federal Special-Concern Species with Potential Habitat at Rocky Flats****Plants**

Bell's Twinpod (*Physaria bellii*)5
Lupine Gentian (*Eustoma grandiflora*)5
Ladder's Mouth Orchid (*Malaxis brachypoda*)5

Insects

Regal Fritillary (*Speyeria idalia*)5

Fish

Plains Topminnow (*Fundulus sciadicus*)5

Birds

Western Snowy Plover (*Charadrius alexandrinus nivosus*)5
Black Tern (*Chlidonias niger*)5

Mammals

Spotted Bat (*Euderma maculatum*)5
Long-eared Myotis (*Myotis evotis*)5
Fringed Bat (*Myotis thysanodes*)5
Long-legged Myotis (*Myotis volans*)5
Pale Townsend's Big-eared Bat (*Plecotus townsendii pallescens*)5
Plains Spotted Skunk (*Spilogale putorius interrupta*)5
Swift Fox (*Vulpes velox*)10,5

Colorado Species of Special Concern with Potential Habitat at Rocky Flats**Fish**

Common Shiner (*Notropis cornutus*)13
Stonecat (*Noturus flavus*)13

Birds

Barrow's Goldeneye (*Bucephala islandica*)13
Plains Sharp-tailed Grouse (*Tympanuchus phasianellus jamesi*)14

Watch-Listed Species Known to Occur at Rocky Flats**Birds**

Black-crowned Night-heron (*Nycticorax nycticorax*)15
Cooper's Hawk (*Accipiter cooperii*)15
Sharp-shinned Hawk (*Accipiter striatus*)15
Golden Eagle (*Aquila chrysaetos*)15
Swainson's Hawk (*Buteo swainsoni*)16
Northern Harrier (*Circus cyaneus*)17
Merlin (*Falco columbarius*)15
Prairie Falcon (*Falco mexicanus*)15
Short-eared Owl (*Asio flammeus*)17
Long-eared Owl (*Asio otus*)15
Olive-sided Flycatcher (*Contopus borealis*)17
Chestnut-sided Warbler (*Dendroica pensylvanica*)17
Virginia's Warbler (*Vermivora virginiae*)17
Baird's Sparrow (*Ammodramus bardii*)17
Grasshopper Sparrow (*Ammodramus savannarum*)15
Lark Bunting (*Calamospiza melanocorys*)17
Chestnut-collared Longspur (*Calcarius ornatus*)17
Field Sparrow (*Spizella pusilla*)17

TABLE 3-14. (cont.)

NOTES:

1. The species *Falco peregrinus* is listed as endangered wherever found in the coterminous 48 states. Some subspecies are listed separately.

Colorado State threatened species (ST).

The USFWS has down-listed the bald eagle to threatened status.

4. This species is resident or regularly visits Rocky Flats.

5. In February 1996, the U. S. Fish and Wildlife Service (USFWS) revised the list of candidate species to include only proposed and C1 species. All former candidate species except C1 species are now classified unofficially as "at-risk" and are still considered special-concern species. The search-list includes these species because they may be upgraded to C-1 species at any time.

6. In March 1997 the USFWS published a proposal to list the Preble's meadow jumping mouse as an endangered species. The final listing decision is pending.

7. Colorado species of special concern (SC).

8. The species has been observed infrequently on Rocky Flats.

9. Listed on August 20, 1997.

10. This species was previously collected near Rocky Flats.

11. These species have historically used areas in the vicinity, and suitable feeding or residential habitat exists at Rocky Flats.

12. Proposed for listing as threatened on March 24, 1998.

13. Federal candidate species for listing as threatened or endangered (C1).

14. Colorado State endangered species.

15. Colorado Natural Heritage Program list of rare and imperiled species.

16. Species of special interest to the Colorado Division of Wildlife due to recent winter range die-off of the species.

17. Birds listed by the USFWS as "Migratory Nongame Birds of Management Concern: the 1995 List" that occur at the Site.

Note: Candidate species lists are under constant revision. As data are reviewed by the USFWS, species are added to and removed from this list on a year-round basis. This list for Rocky Flats Environmental Technology Site is updated annually.

Sources:

1. Colorado Natural Heritage Program 1996 List of Rare and Imperiled Animals, Plants, and Natural Communities.

Federal Registers of appropriate dates.

Migratory Nongame Birds of Management Concern in the United States: the 1995 List.

**TABLE 3-15. BIRD DISTRIBUTION AT ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
BASED ON OBSERVATIONS FROM 1991, 1993-1997,
TOTAL NUMBER OF SPECIES = 188**

ies Common Name	Species Scientific Name	Spec Code	Seasonal Abundance				Habitats					Neotrop Mig (1)	Breeding Status	
			Sp	Su	Fa	Wi	G	D	T	R	W			M
GREBES	PODICIPEDIDAE													
Western Grebe	Aechmophorus occidentalis	AEOC1	R		R							X		
Eared Grebe	Podiceps nigricollis	PONI1	R		R							X		
Pied-billed Grebe	Podilymbus podiceps	POPO1	U	U	U							X		Confirmed
PELICANS	PELECANIDAE													
American White Pelican (2)	Pelecanus erythrorhynchos	PEER1	O	O								X		
CORMORANTS	PHALACROCORACIDAE													
Double-crested Cormorant	Phalacrocorax auritus	PHAU1	O	C	O			X				X		
HERONS	ARDEIDAE													
Great Blue Heron	Ardea herodias	ARHE1	U	C	U		X			X	X	X		
American Bittern*	Botarus lentiginosus	BOLE1		R								X		
Green-backed Heron	Butorides striatus	BUST1	O									X		
Black-crowned Night-heron	Nycticorax nycticorax	NYNY1	U	C				X		X	X	X		Confirmed
White-faced Ibis+A41 (3)	Plegadis chihi	PLCH1		R								X		
GEESE AND DUCKS	ANATIDAE													
Wood Duck	Aix sponsa	AISP1		R								X		Confirmed
Northern Pintail	Anas acuta	ANAC1	O	O								X		
American Wigeon	Anas americana	ANAM1	O	O		O						X		
Northern Shoveler	Anas clypeata	ANCL1	U	U	U							X		
Green-winged Teal	Anas crecca	ANCR1	C	U	O	U						X		
Cinnamon Teal	Anas cyanoptera	ANCY1	C	O								X		
Green-winged Teal	Anas discors	ANDI1	C	O	C							X		Confirmed
Gadwall	Anas platyrhynchos	ANPL1	A	A	C	C	X	X		X	X	X		Confirmed
Gadwall	Anas strepera	ANST1	C	U	U							X		Confirmed
Greater Scaup	Aythya marila	AYMA1	O		O							X		
Lesser Scaup	Aythya affinis	AYAF1	C		U	U						X		
Redhead	Aythya americana	AYAM1	U	U		U						X		Confirmed
Ring-necked Duck	Aythya collaris	AYCO1	U		U							X		
Canvasback	Aythya valisineria	AYVA1				U						X		
Canada Goose	Branta canadensis	BRCA1	U	U	U	U	X				X	X		Confirmed
Bufflehead	Bucephala albeola	BUAL1	U		C	U		X			X	X		
Common Goldeneye	Bucephala clangula	BUCL1	U		U	U						X		
Snow Goose	Chen caerulescens	CHCA1			U		X					X		
Hooded Merganser	Lophodytes cucullatus	LOCU1	O									X		
Common Merganser	Mergus merganser	MEME1	U		O							X		
Ruddy Duck	Oxyura jamaciensis	OXJA1	R	R	R							X		Confirmed
AMERICAN VULTURES	CATHARTIDAE													
Turkey Vulture	Cathartes aura	CAAU1	O	O	O		X	X	X	X	X	X	Yes	
EAGLES AND HAWKS	ACCIPITRIDAE													
Cooper's Hawk	Accipiter cooperii	ACCO1		R	R		X						Yes	
Northern Goshawk (3)	Accipiter gentilis	ACGE1				R	X		X				Yes	
Sharp-shinned Hawk	Accipiter striatus	ACST1	U		U		X	X		X	X		Yes	
Golden Eagle	Aquila chrysaetos	AQCH1	O	O	O	O	X	X	X	X	X	X	Yes	
Red-tailed Hawk	Buteo jamaicensis	BUJA1	C	C	C	C	X	X	X	X	X	X	Yes	Confirmed
Rough-legged Hawk	Buteo lagopus	BULA1	O		C	C	X	X	X	X	X	X		
Ferruginous Hawk (2,3)	Buteo regalis	BURE1	U	U	U	U	X	X	X	X	X	X	Yes	
Swainson's Hawk	Buteo swainsoni	BUSW1	U	U	O		X		X	X	X	X	Yes	Confirmed
Northern Harrier	Circus cyaneus	CICY1	O	U	O	U	X	X	X	X	X	X	Yes	Suspected
Bald Eagle (4)	Haliaeetus leucocephalus	HALE1			O	O	X		X			X		
Osprey*	Pandion haliaetus	PAHA1		R	R							X		

TABLE 3-15. (cont.)

TABLE 3-15. (cont.)														
Species	Species	Spec	Seasonal Abundance				Habitats ²					Neotrop	Breeding	
Common Name	Scientific Name	Code	Sp	Su	Fa	Wi	G	D	T	R	W	M	Mig (1)	Status
FALCONS	FALCONIDAE													
	<i>Falco columbarius</i>	FACO1	R			R			X	X			Yes	
Merriam's Falcon	<i>Falco mexicanus</i>	FAME1	O		O	O	X	X	X	X	X		Yes	
Peregrine Falcon (4)	<i>Falco peregrinus</i>	FAPE1	R		R	R	X		X	X	X		Yes	
American Kestrel	<i>Falco sparverius</i>	FASP1	O	U	U	O	X	X	X	X	X	X	Yes	Confirmed
GROUSE AND TURKEYS	PHASIANIDAE													
Wild Turkey	<i>Meleagris gallopavo</i>	MEGA1	R				X							
Ring-necked Pheasant	<i>Phasianus colchicus</i>	PHCO1	U	U	U	U	X			X	X	X		Suspected
RAILS AND COOTS	RALLIDAE													
American Coot	<i>Fulica americana</i>	FUAM1	U	U	U		X				X	X		Confirmed
Sora	<i>Porzana carolina</i>	POCA1		U								X		Suspected
Virginia Rail	<i>Rallus limicola</i>	RALI1	U									X		Suspected
CRANES	GRUIDAE													
Sandhill Crane (2)	<i>Grus canadensis</i>	GRCA1			O		X					X		
PLOVERS	CHARADRIIDAE													
Killdeer	<i>Charadrius vociferus</i>	CHVO1	C	C	U		X	X		X	X	X		Confirmed
STILTS AND AVOCETS	RECURVIROSTRIDAE													
American Avocet	<i>Recurvirostra americana</i>	REAM1	U									X		
SANDPIPERS AND ALLIES	SCOLOPACIDAE													
Spotted Sandpiper	<i>Actitis macularia</i>	ACMA1	C	U								X		
Pectoral Sandpiper	<i>Calidris melanotos</i>	CAME1	O	O								X		
Semipalmated Sandpiper*	<i>Calidris pusilla</i>	CAPU1	R									X		
Willet	<i>Catoptrophorus semipalmatus</i>	CASE1	U	O								X		
Common Snipe	<i>Gallinago gallinago</i>	GAGA1	U	C	U					X	X	X		Confirmed
Ring-billed Dowitcher	<i>Limnodromus scolopaceus</i>	LISC1	O									X		
Long-billed Curlew (2)	<i>Numenius americanus</i>	NUAM1	R			R	X	X					Yes	
Wilson's Phalarope	<i>Phalaropus tricolor</i>	PHTR1	U									X		
Lesser Yellowlegs	<i>Tringa flavipes</i>	TRFL1	O	O								X		
Greater Yellowlegs	<i>Tringa melanoleuca</i>	TRME1		R								X		
Solitary Sandpiper	<i>Tringa solitaria</i>	TRSO1	U	O								X		
GULLS	LARIDAE													
Ring-billed Gull	<i>Larus delawarensis</i>	LADE1	C	O	O	O	X		X	X	X	X		
Franklin's Gull	<i>Larus pipixcan</i>	LAPI1			O		X					X		
PIGEONS AND DOVES	COLUMBIDAE													
Band-tailed Pigeon	<i>Columba fasciata</i>	COFA1		O			X						Yes	Confirmed
Rock Dove	<i>Columba livia</i>	COLI1	C	C	C	C	X	X		X	X	X		Confirmed
Mourning Dove	<i>Zenaida macroura</i>	ZEMA1	C	C	C		X	X	X	X	X	X		Confirmed
OWLS	STRIGIDAE													
Short-eared Owl	<i>Asio flammeus</i>	ASFL1	O	O	O	O	X		X	X	X		Yes	
Long-eared Owl	<i>Asio otus</i>	ASOT1	O	O	O				X	X	X		Yes	
Burrowing Owl (3)	<i>Athene cunicularia</i>	ATCU1	R	R			X						Yes	
Great Horned Owl	<i>Bubo virginianus</i>	BUVI1	C	C	C	C	X	X	X	X	X	X		Confirmed
NIGHT JARS	CAPRIMULGIDAE													
Common Nighthawk	<i>Chordeiles minor</i>	CHMI1	U	U			X	X	X		X	X	Yes	Confirmed
Common Poorwill	<i>Phalaenoptilus nuttallii</i>	PHNU1		C			X		X				Yes	
SWIFTS	APODIDAE													
Black Swift (3)	<i>Cypseloides niger</i>	CYNI1	R				X						Yes	
HUMMINGBIRDS	TROCHILIDAE													
Broad-tailed Hummingbird	<i>Selasphorus platycercus</i>	SEPL1		O			X	X	X		X		Yes	Suspected
Rufous Hummingbird	<i>Selasphorus rufus</i>	SERU1		O						X			Yes	
FISHERS	ALCEDINIDAE													
Belted Kingfisher	<i>Ceryle alcyon</i>	CEAL1	O	O	O						X	X	Yes	

TABLE 3-15. (cont.)

Species	Species	Spec	Seasonal Abundance				Habitats					Neotrop	Breeding	
Common Name	Scientific Name	Code	Sp	Su	Fa	Wi	G	D	T	R	W	M	Mig (1)	Status
THRASHERS	MIMIDAE													
Gray Catbird	<i>Dumetella carolinensis</i>	DUCA1	U	U						X			Yes	Suspected
Northern Mockingbird	<i>Mimus polyglottos</i>	MIPO1	R	R	R		X			X	X			Suspected
Sage Thrasher	<i>Oreoscoptes montanus</i>	ORMO1	U	U	U		X	X	X	X	X		Yes	Suspected
Brown Thrasher	<i>Toxostoma rufum</i>	TORU1		R					X					
PIPITS	MOTACILLIDAE													
American Pipit	<i>Anthus rubescens</i>	ANRU1	U		U		X				X		Yes	
WAXWINGS	BOMBYCILLIDAE													
Bohemian Waxwing	<i>Bombycilla garrulus</i>	BOGA1				U			X					
SHRIKES	LANIIDAE													
Northern Shrike	<i>Lanius excubitor</i>	LAEX1				O					X			
Loggerhead Shrike (3)	<i>Lanius ludovicianus</i>	LALU1	U	O	O	O	X	X	X	X	X	X	Yes	Suspected
STARLINGS	STURNIDAE													
European Starling	<i>Sturnus vulgaris</i>	STVU1	C	A	C	U	X	X	X	X	X	X		Confirmed
VIREOS	VIREONIDAE													
Warbling Vireo	<i>Vireo gilvus</i>	VEGI1	U	U							X		Yes	Suspected
Solitary Vireo	<i>Vireo solitarius</i>	VISO1			O						X		Yes	
WOOD WARBLERS	EMBERIZIDAE: Parulinae													
Yellow-rumped Warbler	<i>Dendroica coronata</i>	DECO1	C	O	C				X	X	X		Yes	
Black-throated Gray Warbler	<i>Dendroica nigrescens</i>	DENI1				R			X		X		Yes	
Palm Warbler	<i>Dendroica palmarum</i>	DEPA1			R		X					X	Yes	
Chestnut-sided Warbler	<i>Dendroica pensylvanica</i>	DEPE2		R					X				Yes	Suspected
Yellow Warbler	<i>Dendroica petechia</i>	DEPE1	C	C	C		X		X	X	X	X	Yes	Confirmed
Townsend's Warbler	<i>Dendroica townsendi</i>	DETO1			O							X	Yes	
Common Yellowthroat	<i>Geothlypis trichas</i>	GETR1	U	C	C		X		X	X	X	X	Yes	Confirmed
Low-breasted Chat	<i>Icteria virens</i>	ICVI1	U						X		X		Yes	Suspected
MacGillivray's Warbler	<i>Oporornis tolmiei</i>	OPTO1			U		X		X	X	X	X	Yes	
Ovenbird	<i>Seiurus aurocapillus</i>	SEAU1	R						X		X		Yes	
American Redstart	<i>Setophaga ruticilla</i>	SERU2	R						X				Yes	
Virginia's Warbler	<i>Vermivora virginiae</i>	VEVI1			R						X		Yes	
Wilson's Warbler	<i>Wilsonia pusilla</i>	WIPU1			U				X	X	X	X	Yes	
TANAGERS	EMBERIZIDAE: Thraupinae													
Western Tanager	<i>Piranga ludoviciana</i>	PILU1	U		U						X		Yes	
GROSBEAKS AND ALLIES	EMBERIZIDAE: Cardinalinae													
Blue Grosbeak	<i>Guiraca caerulea</i>	GUCA1	U	C	U		X		X	X	X		Yes	Confirmed
Lazuli Bunting	<i>Passerina amoena</i>	PAAM1	O	O					X		X		Yes	
Indigo Bunting	<i>Passerina cyanea</i>	PACY1	O	O							X		Yes	
Black-headed Grosbeak	<i>Pheucticus melanocephalus</i>	PHME1			O						X		Yes	
TOWHEES AND SPARROWS	EMBERIZIDAE: Emberizinae													
Baird's Sparrow (3)	<i>Ammodramus bairdii</i>	AMBA1	R		R		X		X				Yes	
Grasshopper Sparrow	<i>Ammodramus savannarum</i>	AMSA1	C	C	U		X	X	X	X		X	Yes	Confirmed
Lark Bunting	<i>Calamospiza melanocorys</i>	CAME3	O	O	O		X	X					Yes	
Lapland Longspur	<i>Calcarius lapponicus</i>	CALA1				O	X							
Chestnut-collared Longspur	<i>Calcarius ornatus</i>	CAOR1				R	X						Yes	
Snow Bunting	<i>Plectrophenax nivalis</i>	PLNI1			R	R	X							
Lark Sparrow	<i>Chondestes grammacus</i>	CHGR1		O	O				X			X	Yes	Suspected
Dark-eyed Junco	<i>Junco hyemalis</i>	JUHY1	U	U	U	O	X		X	X	X	X	Yes	Suspected
Lincoln's Sparrow	<i>Melospiza lincolni</i>	MELI1	U		U						X	X	Yes	
Fox Sparrow	<i>Passerella iliaca</i>	PAIL1			R				X					
Song Sparrow	<i>Melospiza melodia</i>	MEME2	C	C	C	U	X	X	X	X	X	X		Confirmed
Yankee Sparrow	<i>Passerculus sandwichensis</i>	PASA1	U	U	U		X	X	X	X	X	X	Yes	Suspected
Green-tailed Towhee	<i>Pipilo chlorurus</i>	PICH1	U	U	O				X	X	X		Yes	Suspected
Rufous-sided Towhee	<i>Pipilo erythrophthalmus</i>	PIER1	C	C	C	O	X	X	X	X	X	X	Yes	Confirmed
Vesper Sparrow	<i>Pooecetes gramineus</i>	POGR1	A	A	C		X	X	X	X	X	X	Yes	Confirmed

TABLE 3-15. (cont.)

Species Common Name	Species Scientific Name	Spec Code	Seasonal Abundance				Habitats						Neotrop Mig (1)	Breeding Status
			Sp	Su	Fa	Wi	G	D	T	R	W	M		
American Tree Sparrow	<i>Spizella arborea</i>	SPAR1	U		U	C	X	X	X	X	X	X		
Brewer's Sparrow	<i>Spizella breweri</i>	SPBR1		U	C		X		X		X	X	Yes	
Junco Sparrow	<i>Spizella pusilla</i>	SPPU1		R						X				
Clay-colored Sparrow	<i>Spizella pallida</i>	SPPA2			U	U	X		X		X	X	Yes	
Chipping Sparrow	<i>Spizella passerina</i>	SPPA1	U	U	C	O	X	X	X	X	X	X	Yes	
White-crowned Sparrow	<i>Zonotrichia leucophrys</i>	ZOLE1	C		C		X		X	X	X			
Harris' Sparrow	<i>Zonotrichia querula</i>	ZOQU1				R					X			
MEADOWLARKS, BLACKBIRD <i>EMBERIZIDAE: Icterinae</i>														
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	AGPH1	A	A	C	U	X	X	X	X	X	X	Yes	Confirmed
Brewer's Blackbird	<i>Euphagus cyanocephalus</i>	EUCY1	C	U	O		X	X	X	X	X	X	Yes	Confirmed
Northern Oriole	<i>Icterus galbula</i>	ICGA1	C	C			X		X	X	X	X	Yes	Confirmed
Brown-headed Cowbird	<i>Molothrus ater</i>	MOAT1	U	C			X		X	X	X	X	Yes	Suspected
Common Grackle	<i>Quiscalus quiscula</i>	QUQU1	U	C	O		X	X		X	X	X		Confirmed
Western Meadowlark	<i>Sturnella neglecta</i>	STNE1	A	A	A	O	X	X	X	X	X	X	Yes	Confirmed
Yellow-headed Blackbird	<i>Xanthocephalus xanthocephalus</i>	XAXA1	C	C							X	X	Yes	Confirmed
FINCHES <i>FRINGILLIDAE</i>														
Pine Siskin	<i>Carduelis pinus</i>	CAPI1	U	O	O	O	X		X	X	X	X	Yes	
Lesser Goldfinch	<i>Carduelis psaltria</i>	CAPS1	O	U	O		X	X	X	X	X		Yes	Suspected
American Goldfinch	<i>Carduelis tristis</i>	CATR1	C	A	C	O	X	X	X	X	X	X	Yes	Confirmed
Cassin's Finch	<i>Carpodacus cassinii</i>	CACA2	R							X			Yes	
House Finch	<i>Carpodacus mexicanus</i>	CAME2	A	A	A	U	X	X	X	X	X	X		Confirmed
OLD WORLD SPARROWS <i>PASSERIDAE</i>														
House Sparrow	<i>Passer domesticus</i>	PADO1	C	C	C	C	X	X			X			Confirmed

DEFINITIONS

SEASONS

Sp = Spring
Su = Summer
Fa = Fall
Wi = Winter

HABITATS

G = Grassland
D = Disturbed
T = Tall Upland Shrubland
R = Riparian Shrubland
W = Woodland
M = Marshland

RELATIVE ABUNDANCE

(In appropriate habitat for species)
A = Abundant
C = Common
U = Uncommon
O = Occasional
R = Rare at the Site

NOTE

Taxonomic organization of table follows "Colorado Birds: A reference to their distribution and habitat," Andrews & Righter, 1992.

(1) Neotropical Migrants are a passerine bird group of concern due to significant population declines over two continents.

(2) A Colorado Species of Special Concern

(3) Federal special-concern species

(4) Federal threatened or endangered species

*New species for 1997

TABLE 3-16. MIGRATORY BIRD HABITAT USE AT ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BASED ON MULTI-SPECIES CENSUS SURVEYS

Common Name	Species Code	Habitat Type	Number of Observations	Observations/ Minute in Habitat ^a	Percent of Species/ Habitat	Total number of Observations for Species
Winter						
Red-winged Blackbird	AGPH1	30	1	0.021	100.00	1
House Finch	CAME2	110	1	0.003	100.00	1
Northern Flicker	COAU1	20	1	0.008	5.00	
Northern Flicker	COAU1	110	16	0.052	80.00	
Northern Flicker	COAU1	212	1	0.014	5.00	
Northern Flicker	COAU1	230	2	0.013	10.00	20
Common Raven	COCO1	20	2	0.016	28.57	
Common Raven	COCO1	110	4	0.013	57.14	
Common Raven	COCO1	230	1	0.006	14.29	7
Horned Lark	ERAL1	20	1	0.008	3.57	
Horned Lark	ERAL1	110	2	0.006	7.14	
Horned Lark	ERAL1	212	2	0.027	7.14	
Horned Lark	ERAL1	322	3	0.035	10.71	
Horned Lark	ERAL1	323	20	0.134	71.43	28
Song Sparrow	MEME2	10	1	0.030	12.50	
Song Sparrow	MEME2	30	1	0.021	12.50	
Song Sparrow	MEME2	110	3	0.010	37.50	
Song Sparrow	MEME2	212	1	0.014	12.50	
Song Sparrow	MEME2	230	2	0.013	25.00	8
Black-capped Chickadee	PAAT1	110	28	0.090	84.85	
Black-capped Chickadee	PAAT1	230	5	0.032	15.15	33
Black-billed Magpie	PIPI1	20	3	0.024	6.82	
Black-billed Magpie	PIPI1	30	1	0.021	2.27	
Black-billed Magpie	PIPI1	110	21	0.068	47.73	
Black-billed Magpie	PIPI1	212	1	0.014	2.27	
Black-billed Magpie	PIPI1	230	18	0.115	40.91	44
Downy Woodpecker	PIPU1	110	1	0.003	100.00	1
Snow Bunting	PLNI1	323	2	0.013	100.00	2
American Tree Sparrow	SPAR1	10	1	0.030	1.82	
American Tree Sparrow	SPAR1	20	2	0.016	3.64	
American Tree Sparrow	SPAR1	110	43	0.139	78.18	
American Tree Sparrow	SPAR1	212	2	0.027	3.64	
American Tree Sparrow	SPAR1	230	5	0.032	9.09	
American Tree Sparrow	SPAR1	540	2	0.154	3.64	55
Western Meadowlark	STNE1	20	1	0.008	33.33	
Western Meadowlark	STNE1	211	2	0.051	66.67	3
European Starling	STVU1	10	1	0.030	0.65	
European Starling	STVU1	110	51	0.165	33.33	
European Starling	STVU1	212	97	1.329	63.40	
European Starling	STVU1	230	3	0.019	1.96	
European Starling	STVU1	322	1	0.012	0.65	153
American Robin	TUMI1	110	1	0.003	2.27	
American Robin	TUMI1	230	39	0.250	88.64	
American Robin	TUMI1	322	4	0.047	9.09	44
Spring						
Red-winged Blackbird	AGPH1	20	86	0.500	32.21	
Red-winged Blackbird	AGPH1	30	71	0.717	26.59	
Red-winged Blackbird	AGPH1	54	14	0.095	5.24	
Red-winged Blackbird	AGPH1	93	3	0.120	1.12	
Red-winged Blackbird	AGPH1	110	28	0.068	10.49	
Red-winged Blackbird	AGPH1	212	43	0.319	16.10	
Red-winged Blackbird	AGPH1	230	14	0.067	5.24	
Red-winged Blackbird	AGPH1	322	3	0.038	1.12	
Red-winged Blackbird	AGPH1	324	2	0.057	0.75	
Red-winged Blackbird	AGPH1	540	3	0.273	1.12	267

TABLE 3-16. (cont.)

Common Name	Species Code	Habitat Type	Number of Observations	Observations/ Minute in Habitat ^a	Percent of Species/ Habitat	Total number of Observations for Species
Spring (cont.)						
Northern Oriole	ICGA1	20	1	0.006	2.63	
Northern Oriole	ICGA1	110	30	0.073	78.95	
Northern Oriole	ICGA1	230	7	0.034	18.42	38
Yellow-breasted Chat	ICVI1	230	6	0.029	100.00	6
Dark-eyed Junco	JUHY1	110	10	0.024	83.33	
Dark-eyed Junco	JUHY1	230	2	0.010	16.67	12
Lincoln's Sparrow	MELI1	110	8	0.019	100.00	8
Song Sparrow	MEME2	20	4	0.023	4.17	
Song Sparrow	MEME2	30	20	0.202	20.83	
Song Sparrow	MEME2	110	39	0.095	40.63	
Song Sparrow	MEME2	212	6	0.044	6.25	
Song Sparrow	MEME2	230	27	0.130	28.13	96
Brown-headed Cowbird	MOAT1	30	2	0.020	10.00	
Brown-headed Cowbird	MOAT1	110	9	0.022	45.00	
Brown-headed Cowbird	MOAT1	212	1	0.007	5.00	
Brown-headed Cowbird	MOAT1	230	7	0.034	35.00	
Brown-headed Cowbird	MOAT1	540	1	0.091	5.00	20
Townsend's Solitaire	MYTO1	322	2	0.025	100.00	2
Black-capped Chickadee	PAAT1	110	5	0.012	55.56	
Black-capped Chickadee	PAAT1	230	4	0.019	44.44	9
Green-tailed Towhee	PICH1	110	1	0.002	20.00	
Green-tailed Towhee	PICH1	230	4	0.019	80.00	5
Rufous-sided Towhee	PIER1	230	24	0.115	100.00	24
Black-billed Magpie	PIPI1	10	1	0.111	3.03	
Black-billed Magpie	PIPI1	20	3	0.017	9.09	
Black-billed Magpie	PIPI1	30	1	0.010	3.03	
Black-billed Magpie	PIPI1	110	17	0.041	51.52	
Black-billed Magpie	PIPI1	230	10	0.048	30.30	
Black-billed Magpie	PIPI1	323	1	0.005	3.03	33
Vesper Sparrow	POGR1	20	11	0.064	14.86	
Vesper Sparrow	POGR1	30	1	0.010	1.35	
Vesper Sparrow	POGR1	110	13	0.032	17.57	
Vesper Sparrow	POGR1	211	2	0.091	2.70	
Vesper Sparrow	POGR1	212	1	0.007	1.35	
Vesper Sparrow	POGR1	230	3	0.014	4.05	
Vesper Sparrow	POGR1	322	8	0.101	10.81	
Vesper Sparrow	POGR1	323	28	0.151	37.84	
Vesper Sparrow	POGR1	324	7	0.200	9.46	74
Common Grackle	QUQU1	110	1	0.002	100.00	1
Eastern Phoebe	SAPH1	230	1	0.005	100.00	1
Say's Phoebe	SASA1	110	1	0.002	33.33	
Say's Phoebe	SASA1	212	1	0.007	33.33	
Say's Phoebe	SASA1	324	1	0.029	33.33	3
Mountain Bluebird	SICU1	110	8	0.019	66.67	
Mountain Bluebird	SICU1	322	3	0.038	25.00	
Mountain Bluebird	SICU1	324	1	0.029	8.33	12
Western Meadowlark	STNE1	10	1	0.111	0.43	
Western Meadowlark	STNE1	20	20	0.116	8.55	
Western Meadowlark	STNE1	30	7	0.071	2.99	
Western Meadowlark	STNE1	54	1	0.007	0.43	
Western Meadowlark	STNE1	93	2	0.080	0.85	
Western Meadowlark	STNE1	110	81	0.197	34.62	
Western Meadowlark	STNE1	212	12	0.089	5.13	
Western Meadowlark	STNE1	230	25	0.120	10.68	
Western Meadowlark	STNE1	322	30	0.380	12.82	
Western Meadowlark	STNE1	323	44	0.237	18.80	
Western Meadowlark	STNE1	324	11	0.314	4.70	234

TABLE 3-16. (cont.)

Common Name	Species Code	Habitat Type	Number of Observations	Observations/ Minute in Habitat ^a	Percent of Species/ Habitat	Total number of Observations for Species
Spring (cont.)						
European Starling	STVU1	20	1	0.006	0.83	
European Starling	STVU1	30	13	0.131	10.74	
European Starling	STVU1	93	2	0.080	1.65	
European Starling	STVU1	110	65	0.158	53.72	
European Starling	STVU1	212	32	0.237	26.45	
European Starling	STVU1	322	2	0.025	1.65	
European Starling	STVU1	324	6	0.171	4.96	121
Tree Swallow	TAB11	30	10	0.101	100.00	10
Violet-green Swallow	TATH1	30	27	0.273	93.10	
Violet-green Swallow	TATH1	230	2	0.010	6.90	29
American Robin	TUM11	110	35	0.085	68.63	
American Robin	TUM11	212	3	0.022	5.88	
American Robin	TUM11	230	13	0.063	25.49	51
Western Kingbird	TYVE1	110	8	0.019	57.14	
Western Kingbird	TYVE1	322	6	0.076	42.86	14
Yellow-headed Blackbird	XAXA1	30	21	0.212	91.30	
Yellow-headed Blackbird	XAXA1	212	1	0.007	4.35	
Yellow-headed Blackbird	XAXA1	230	1	0.005	4.35	23
Mourning Dove	ZEMA1	10	1	0.111	2.00	
Mourning Dove	ZEMA1	20	4	0.023	8.00	
Mourning Dove	ZEMA1	30	2	0.020	4.00	
Mourning Dove	ZEMA1	110	28	0.068	56.00	
Mourning Dove	ZEMA1	212	9	0.067	18.00	
Mourning Dove	ZEMA1	230	5	0.024	10.00	
Mourning Dove	ZEMA1	324	1	0.029	2.00	50
White-crowned Sparrow	ZOLE1	30	1	0.010	4.55	
White-crowned Sparrow	ZOLE1	110	18	0.044	81.82	
White-crowned Sparrow	ZOLE1	230	2	0.010	9.09	20
Summer						
Red-winged Blackbird	AGPH1	10	22	0.314	3.62	
Red-winged Blackbird	AGPH1	20	41	0.513	6.74	
Red-winged Blackbird	AGPH1	30	250	1.969	41.12	
Red-winged Blackbird	AGPH1	54	5	0.049	0.82	
Red-winged Blackbird	AGPH1	93	169	5.452	27.80	
Red-winged Blackbird	AGPH1	110	36	0.110	5.92	
Red-winged Blackbird	AGPH1	212	25	0.272	4.11	
Red-winged Blackbird	AGPH1	230	22	0.104	3.62	
Red-winged Blackbird	AGPH1	323	36	0.286	5.92	
Red-winged Blackbird	AGPH1	324	2	0.059	0.33	608
Grasshopper Sparrow	AMSA1	10	6	0.086	11.11	
Grasshopper Sparrow	AMSA1	20	2	0.025	3.70	
Grasshopper Sparrow	AMSA1	30	9	0.071	16.67	
Grasshopper Sparrow	AMSA1	110	3	0.009	5.56	
Grasshopper Sparrow	AMSA1	211	4	0.068	7.41	
Grasshopper Sparrow	AMSA1	230	3	0.014	5.56	
Grasshopper Sparrow	AMSA1	323	28	0.222	51.85	54
House Finch	CAME2	10	18	0.257	2.17	
House Finch	CAME2	20	10	0.125	1.21	
House Finch	CAME2	30	15	0.118	1.81	
House Finch	CAME2	54	3	0.029	0.36	
House Finch	CAME2	110	519	1.587	62.61	
House Finch	CAME2	211	28	0.475	3.38	
House Finch	CAME2	212	58	0.630	7.00	
House Finch	CAME2	230	64	0.302	7.72	
House Finch	CAME2	322	28	0.364	3.38	
House Finch	CAME2	323	37	0.294	4.46	
House Finch	CAME2	324	16	0.471	1.93	
House Finch	CAME2	540	33	2.538	3.98	829

TABLE 3-16. (cont.)

Common Name	Species Code	Habitat Type	Number of Observations	Observations/ Minute in Habitat ^a	Percent of Species/ Habitat	Total number of Observations for Species
Summer (cont.)						
Lark Bunting	CAME3	230	55	0.259	100.00	55
Lesser Goldfinch	CAPS1	10	2	0.029	5.56	
Lesser Goldfinch	CAPS1	30	1	0.008	2.78	
Lesser Goldfinch	CAPS1	110	17	0.052	47.22	
Lesser Goldfinch	CAPS1	230	16	0.075	44.44	36
American Goldfinch	CATR1	10	2	0.029	1.17	
American Goldfinch	CATR1	20	2	0.025	1.17	
American Goldfinch	CATR1	30	3	0.024	1.75	
American Goldfinch	CATR1	54	1	0.010	0.58	
American Goldfinch	CATR1	110	92	0.281	53.80	
American Goldfinch	CATR1	211	6	0.102	3.51	
American Goldfinch	CATR1	212	7	0.076	4.09	
American Goldfinch	CATR1	230	58	0.274	33.92	171
Lark Sparrow	CHGR1	110	3	0.009	42.86	
Lark Sparrow	CHGR1	212	3	0.011	42.86	
Lark Sparrow	CHGR1	230	1	0.033	14.29	7
Common Nighthawk	CHM11	324	1	0.029	100.00	1
Northern Flicker	COAU1	110	1	0.003	100.00	1
Common Raven	COCO1	110	1	0.003	100.00	1
Rock Dove	COL11	110	2	0.006	100.00	2
Western Wood-Pewee	COSO1	230	1	0.005	100.00	1
Yellow-rumped Warbler	DECO1	110	1	0.003	100.00	1
Yellow Warbler	DEPE1	110	18	0.055	72.00	
Yellow Warbler	DEPE1	211	1	0.017	4.00	
Yellow Warbler	DEPE1	212	1	0.011	4.00	
Yellow Warbler	DEPE1	230	5	0.024	20.00	25
Horned Lark	ERAL1	323	7	0.056	100.00	7
Brewer's Blackbird	EUCY1	20	21	0.263	23.60	
Brewer's Blackbird	EUCY1	30	35	0.276	39.33	
Brewer's Blackbird	EUCY1	54	1	0.010	1.12	
Brewer's Blackbird	EUCY1	110	27	0.083	30.34	
Brewer's Blackbird	EUCY1	212	1	0.011	1.12	
Brewer's Blackbird	EUCY1	323	4	0.032	4.49	89
Common Yellowthroat	GETR1	20	1	0.013	2.70	
Common Yellowthroat	GETR1	30	15	0.118	40.54	
Common Yellowthroat	GETR1	110	6	0.018	16.22	
Common Yellowthroat	GETR1	211	2	0.034	5.41	
Common Yellowthroat	GETR1	212	10	0.109	27.03	
Common Yellowthroat	GETR1	230	3	0.014	8.11	37
Blue Grosbeak	GUCA1	20	4	0.050	10.26	
Blue Grosbeak	GUCA1	110	20	0.061	51.28	
Blue Grosbeak	GUCA1	211	4	0.068	10.26	
Blue Grosbeak	GUCA1	212	5	0.054	12.82	
Blue Grosbeak	GUCA1	322	3	0.039	7.69	
Blue Grosbeak	GUCA1	323	3	0.024	7.69	39
Cliff Swallow	HIPY1	10	1	0.014	0.60	
Cliff Swallow	HIPY1	20	2	0.025	1.20	
Cliff Swallow	HIPY1	30	3	0.024	1.80	
Cliff Swallow	HIPY1	54	16	0.157	9.58	
Cliff Swallow	HIPY1	110	102	0.312	61.08	
Cliff Swallow	HIPY1	211	2	0.034	1.20	
Cliff Swallow	HIPY1	212	20	0.217	11.98	
Cliff Swallow	HIPY1	230	11	0.052	6.59	
Cliff Swallow	HIPY1	322	1	0.013	0.60	
Cliff Swallow	HIPY1	323	9	0.071	5.39	167

Appendix A

Data Entry Instructions for Wildlife Databases

**CODE ENTRY EXPLANATIONS AND INSTRUCTIONS
FOR WILDLIFE DATA ENTRY INTO SITEWIDE, MULTI-SPECIES, AND SITEWIDE SURVEY
DATABASES**

INTRODUCTION

Information and data may be entered from field data sheets, log books, fortuitous sighting reports, and any other reliable sources, provided minimum data are reported. Minimum data for a record to be entered into this database are: species, date, location, habitat type, number of individuals, and identity of observer.

SITEWIDE SIGNIFICANT SPECIES SURVEYS AND FORTUITOUS OBSERVATIONS

Data for Sitewide Significant Species Surveys and Fortuitous observations shall be entered into either the Sitewide Survey Database (SSD) or Fortuitous Observation Database (FOD) according to the instructions listed below.

Observer (Observer)

Enter initials of the primary observer (up to 3 letters).

Type of Observation (Obs. type)

Observation Codes:

1	=	Visual (includes dead individuals)
2	=	Trap/Net Capture
3	=	Hand Capture
4	=	Radio Fix
5	=	Tracks
6	=	Scat/Pellets
7	=	Hair/Feathers/Other Remains
8	=	Sound/Vocalization
9	=	Photographic Evidence
10	=	Nest/Eggs

Type of Survey (Type Survey)

Enter Fortuitous or Sitewide

Date of Observation (Date)

Input observation date as mm/dd/yy (e.g., 02/04/95)

Time of Observation (Time)

Enter observation time using 24-hour military time clock (e.g., 1310 for 1:10 PM)

Taxonomic Group Code (Taxn Grup)

Groups to be recorded include big game mammals; furbearers; small game mammals; upland game birds; waterfowl and wading birds; raptors; reptiles and amphibians; and threatened, endangered, and candidate species.

Taxonomic Group Codes:

B	=	Big Game	L	=	Lepidoptera
C	=	Carnivores	P	=	Soil Protozoa
Y	=	Lagomorphs, Large Rodents, Bats	N	=	Soil Nematodes
H	=	Herptiles (Reptiles/Amphibians)	A	=	Soil Arthropods
F	=	Fish	1	=	Surface/Terrestrial Invertebrates
R	=	Raptors	Q	=	Aquatic Invertebrates
U	=	Upland Game Birds	O	=	Zooplankton
U	=	Waterbirds	V	=	Vegetation
S	=	Songbirds	G	=	Algae

Species Code (Species Code)

Enter species code from Current Approved Species Code (see Attachment A).

Observation Area (Admin Area)

Enter code for observation area relative to Rocky Flats:

Administrative Area Codes:

PA	=	Protected Area
IA	=	Industrial Area
BZ	=	Buffer Zone
EA	=	Extended Observation Area*

*Within 10 km of Rocky Flats boundary.

Name of Observation Location (Site Name)

Enter name of transect, pond, or other physical feature at observation location, if applicable.

Name of Operable Unit (OU)

Enter Operable Unit name of observation area, if applicable.

North-South Rocky Flats Grid Code (RF Grid N)

Enter alphanumeric code number (1-17) for location of observation according to Rocky Flats Grid (see Attachment B for map).

East-West Rocky Flats Grid Code (RF Grid E)

Enter alphanumeric code letter (A-U) for location of observation according to Rocky Flats Grid (see Attachment B for map).

Activity Codes (Activity & Activity 2)

Enter primary activity code in Activity column and secondary activity code in Activity 2 column.

Activity Codes:

Fauna:			
0	=	Inactive/Immobile	13 = Socialization/Playing
1	=	In Transit	14 = Being Prey
2	=	Walking/Leisurely Flight	15 = Drinking
3	=	Running/Rapid Flight	16 = Swimming
4	=	Fleeing	17 = Territorial Behavior
5	=	Feeding/Hunting	18 = Dead
6	=	Courtship	19 = Defense of Young
7	=	Nursing/Feeding Young	20 = Giving Birth
8	=	Nesting/Incubating	21 = Sick/Injured
9	=	Nesting/Brooding	22 = Asleep
10	=	Nest Building	23 = In Trap
11	=	Fighting/Aggression	24-49 = (Open)
12	=	Grooming/Preening	
Flora:			
50	=	Died Back/Standing Dead	
51	=	Vegetative	
52	=	In Bud	
53	=	In Flower	
54	=	In Fruit/Seed	

Description of Habitat at Observation Location (Hab Type, Hab Type 2)

Enter habitat code for Hab Type. Enter secondary habitat code for Hab Type 2. See list below for wildlife habitat codes.

Wildlife Habitat Codes:

Code	Habitat Description	Code	Habitat Description
000	Aquatic and Wetlands Habitats Group	093	Impoundment Edge
	<i>Terrestrial Subgroup</i>	094	Dugout Edge
010	Wet Meadow/Marsh Ecotone	095	Ditch Edge
020	Short Marsh (Carex/Juncus)	100	Woodlands Habitats Group
030	Tall Marsh (Typha/Scirpus)	110	Riparian Woodland (Populus, Salix and Associated)
	<i>Open Water Subgroup</i>	120	Ponderosa Woodland (Pinus ponderosa and Associated)
040	Streams and Rivers	125	Douglas-fir Woodland (Pseudotsuga menziesii and Associated)*
041	Intermittent Stream - Riffle	130	Tree Plantings (Ornamentals and Shelterbelts)

042	Intermittent Stream - Run	200	Shrublands Habitats Group
043	Intermittent Stream - Pool	210	Riparian Shrubland (Salix, Amorpha, and Associated)
044	Persistent Stream - Riffle	211	Riparian Shrubland - Amorpha
045	Persistent Stream - Run	212	Riparian Shrubland - Salix
046	Persistent Stream - Pool	220	Short Upland Shrubland (Symphoricarpos and Associated)
047	Ditch (Drainage/Irrigation) - Riffle	230	Tall Upland Shrubland (Crataegus, Prunus, and Associated)
048	Ditch (Drainage/Irrigation) - Run	240	Rabbitbrush Shrubland (Chrysothamnus and Associated)
049	Ditch (Drainage/Irrigation) - Pool	250	Mountain Mahogany/Bitterbrush Shrubland (Cercocarpus, Purshia, and Associated)
050	Ponds and Impoundments	260	Savannah Shrubland (Rhus, Ribes, Physocarpus, and Associated)
051	Natural Pond - Littoral Zone*	300	Grasslands Habitats Group
052	Natural Pond - Limnetic Zone*	310	Short Grassland (Buchloe, Bouteloua, and Associated)
053	Natural Pond - Profundal Zone*	320	Mixed Grassland (General)
054	Impoundment - Littoral Zone	322	Mesic Mixed Grassland (Agropyron, Bouteloua, Poa, and Associated)
055	Impoundment - Limnetic Zone	323	Xeric Mixed Grassland (Andropogon, Stipa, Muhlenbergia, and Associated)
056	Impoundment - Profundal Zone	324	Reclaimed Mixed Grassland (Planted grass mixtures)
057	Dugout/Excavated Pond - Littoral Zone	325	Overgrazed Pasture
058	Dugout/Excavated Pond - Limnetic Zone	400	Disturbance Habitat Group
059	Dugout/Excavated Pond - Profundal Zone	410	Annual Grass/Forb (Bromus japonicus, Bromus tectorum, Centaurea, Helianthus)
060	Lakes and Reservoirs*	420	Disturbed/Barren Lands (Roads, dirt lots)
061	Littoral Zone	430	Cultivated Lands*
062	Limnetic Zone	500	Structures and Structure Associations Habitats Group
063	Profundal Zone	510	Transmission Lines
070	Springs and Seeps	520	Buildings/Structures
071	Persistent	530	Rock and Gravel Piles
072	Intermittent	540	Roadside/Fencerow Complex
080	Groundwater	550	Debris Piles
<i>Emergent Subgroup</i>		560	Fence
090	Mudflats	600	Special Features Group*
091	Stream Edge	610	Cliffs
092	Natural Pond Edge*	620	Caves

Temperature During Observation (Temp)

Enter temperature in degrees Celsius, enter temperatures below zero with a minus (e.g., -4°C).

Wind Speed (Wind Speed)

Enter approximate wind speed in miles per hour.

Wind Direction (Wind Direct)

Enter wind direct using directional code up to 2 letters.

Wind Direction Codes:

N	=	North
NE	=	Northeast
E	=	East
SE	=	Southeast
S	=	South
SW	=	Southwest
W	=	West
NW	=	Northwest

Significant Weather Conditions Present (Weather)**Weather Condition Codes:**

0	=	No significant weather conditions
1	=	Fog/smog, visibility less than 1 km
2	=	Drizzle or mist
3	=	Rain
4	=	Hail
5	=	Snow or sleet
6	=	Thunderstorm
7	=	Blowing sand or dust

Group Size (Group Size)

Enter total number of individuals in the group.

Number of Males (Male)

Enter number of males.

Number of Females (Female)

Enter number of females.

Number of Young (Young)

Enter number of young.

Number of Unclassified Individuals (Un-Classd)

Enter number of unclassified individuals.

DATA ENTRY INSTRUCTIONS FOR MULTI-SPECIES CENSUS SURVEYS

Data for Multi-species Census Surveys shall be entered into either the Sitewide Survey Database (SSD) or Fortuitous Observation Database (FOD) according to the instructions listed below.

Observer (Observer)

Enter initials of the primary observer (up to 3 letters).

Date of Observation (Date)

Input observation date as mm/dd/yy (e.g., 02/04/95)

Time of Observation (Time)

Enter observation time using 24-hour military time clock (e.g., 1310 for 1:10 PM)

Elapsed Time Calculation

This series of entries will allow the program to calculate the elapsed time in each habitat. In the field labeled "Hour In" enter the hour of the recorded time for entry into each habitat. Enter the minute of entry in "Minute In." Repeat this process for "Hour Out" and "Minute Out." The fields labeled "Calc1, Calc2, Calc3, Calc4 and Elapsed Time" will show the automatically calculated time spent between entry and exit of the habitat unit. Enter the number shown in "Elapsed Time" field only in the first record under "Time in Habitat" for any given entry/exit of a habitat unit.

Example:

Time	Hour In	Minute In	Hour Out	Minute Out	Calc1	Calc2	Calc3	Calc4	Elapsed Time	Time in Habitat
1526	15	26	15	36	900	926	900	936	10	10
1526	15	26	15	36	900	926	900	936	10	
1526	15	26	15	36	900	926	900	936	10	
1526	15	26	15	36	900	926	900	936	10	
1536	15	36	15	38	900	936	900	938	2	2
1538	15	38	15	44	900	938	900	944	6	6
1544	15	44	15	45	900	944	900	945	1	1
1545	15	45	15	49	900	945	900	949	4	4

Type of Observation (Obs. type)

Observation Codes:

1	= Visual (includes dead individuals)
2	= Trap/Net Capture
3	= Hand Capture
4	= Radio Fix
5	= Tracks
6	= Scat/Pellets

7	=	Hair/Feathers/Other Remains
8	=	Sound/Vocalization
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10	=	Nest/Eggs

Taxonomic Group Code (Taxn Grup)

Groups to be recorded include big game mammals; furbearers; small game mammals; upland game birds; waterfowl and wading birds; raptors; reptiles and amphibians; and threatened, endangered, and candidate species.

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Species Code (Species Code)

Enter species code from Current Approved Species Code (see Attachment A).

Observation Area (Admin Area)

Enter code for observation area relative to Rocky Flats:

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PA	=	Protected Area
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*Within 10 km of Rocky Flats boundary.

Name of Observation Location (Site Name)

Enter name of transect, pond, or other physical feature at observation location, if applicable.

Name of Operable Unit (OU)

Enter Operable Unit name of observation area, if applicable.

North-South Rocky Flats Grid Code (RF Grid N)

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12	= Grooming/Preening		
Flora:			
50	= Died Back/Standing Dead		
51	= Vegetative		
52	= In Bud		
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Wildlife Habitat Codes:

Code	Habitat Description	Code	Habitat Description
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Open Water Subgroup		120	Ponderosa Woodland (Pinus ponderosa and Associated)
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070	Springs and Seeps	520	Buildings/Structures
071	Persistent	530	Rock and Gravel Piles
072	Intermittent	540	Roadside/Fencerow Complex
080	Groundwater	550	Debris Piles
Emergent Subgroup		560	Fence
090	Mudflats	600	Special Features Group*
091	Stream Edge	610	Cliffs
092	Natural Pond Edge*	620	Caves

Temperature During Observation (Temp)

Enter temperature in degrees Celsius, enter temperatures below zero with a minus (e.g., -4°C).

Wind Speed (Wind Speed)

Enter approximate wind speed in miles per hour.

Wind Direction (Wind Direct)

Enter wind direct using directional code up to 2 letters.

Wind Direction Codes:

N	=	North
NE	=	Northeast
E	=	East
SE	=	Southeast
S	=	South
SW	=	Southwest
W	=	West
NW	=	Northwest

Significant Weather Conditions Present (Weather)**Weather Condition Codes:**

0	=	No significant weather conditions
1	=	Fog/smog, visibility less than 1 km
2	=	Drizzle or mist
3	=	Rain
4	=	Hail
5	=	Snow or sleet
6	=	Thunderstorm
7	=	Blowing sand or dust

Group Size (Group Size)

Enter total number of individuals in the group.

Number of Males (Male)

Enter number of males.

Number of Females (Female)

Enter number of females.

Number of Young (Young)

Enter number of young.

Number of Unclassified Individuals (Un-Classd)

Enter number of unclassified

Attachment A
Current Approved Species Code List for Data Entry

COMMON NAME	SCIENTIFIC NAME	SPECIES CODE
AMPHIBIANS		
SALAMANDERS	AMBYSTOMATIDAE	
Tiger Salamander	<i>Ambystoma tigrinum</i>	AMTI1
SPADEFoot TOADS	PELOBATIDAE	
Plains Spadefoot	<i>Scaphiophus bombifrons</i>	SCBO1
TOADS	BUFONIDAE	
Great Plains Toad	<i>Bufo cognatus</i>	BUCO1
Woodhouse's Toad	<i>Bufo woodhousei</i>	BUWO1
TREE FROGS	HYLIDAE	
Boreal Chorus Frog	<i>Pseudacris triseriatus maculata</i>	PSTR1
FROGS	RANIDAE	
Bullfrog	<i>Rana catesbeiana</i>	RACA1
Northern Leopard Frog	<i>Rana pipiens</i>	RAPI1
REPTILES		
TURTLES	CHELYDRIDAE	
Western Painted Turtle	<i>Chrysemys picta</i>	CHPI1
LIZARDS	IGUANIDAE	
Short-horned Lizard	<i>Phrynosoma douglassi</i>	PHDO1
Eastern Fence Lizard	<i>Sceloporus undulatus</i>	SCUN1
COLUBRID SNAKES	COLUBRIDAE	
Eastern Yellowbelly Racer	<i>Coluber constrictor</i>	COCO1
Bullsnake	<i>Pituophis melanoleucus</i>	PIME1
Western Plains Garter Snake	<i>Thamnophis radix</i>	THRA1
Red-sided Garter Snake	<i>Thamnophis sirtalis</i>	THSI1
Wandering Garter Snake	<i>Thamnophis elegans</i>	THEL1
VIPERS	VIPERIDAE	
Prairie Rattlesnake	<i>Crotalus viridis</i>	CRVI1
BIRDS		
GREBES	PODICIPEDIDAE	
Western Grebe	<i>Aechmophorus occidentalis</i>	AEOC1
Eared Grebe	<i>Podiceps nigricollis</i>	PONI1
Pied-billed Grebe	<i>Podilymbus podiceps</i>	POPO1
PELICANS	PELECANIDAE	
American White Pelican	<i>Pelecanus erythrorhynchos</i>	PEER1
CORMORANTS	PHALACROCORACIDAE	
Double-crested Cormorant	<i>Phalacrocorax auritus</i>	PHAU1
HERONS	ARDEIDAE	
Great Blue Heron	<i>Ardea herodias</i>	ARHE1
Green-backed Heron	<i>Butorides striatus</i>	BUST1
Black-crowned Night-Heron	<i>Nycticorax nycticorax</i>	NYNY1
GEESE & DUCKS	ANATIDAE	
Wood Duck	<i>Aix sponsa</i>	AISP1
Northern Pintail	<i>Anas acuta</i>	ANAC1
American Wigeon	<i>Anas americana</i>	ANAM1
Northern Shoveler	<i>Anas clypeata</i>	ANCL1
Green-winged Teal	<i>Anas crecca</i>	ANCR1
Cinnamon Teal	<i>Anas cyanoptera</i>	ANCY1
Blue-winged Teal	<i>Anas discors</i>	ANDI1
Mallard	<i>Anas platyrhynchos</i>	ANPL1
Gadwall	<i>Anas strepera</i>	ANST1
Lesser Scaup	<i>Aythya affinis</i>	AYAF1

Attachment A
Current Approved Species Code List for Data Entry

COMMON NAME	SCIENTIFIC NAME	SPECIES CODE
Redhead	<i>Aythya americana</i>	AYAM1
Ring-necked Duck	<i>Aythya collaris</i>	AYCO1
Greater Scaup	<i>Aythya marila</i>	AYMA1
Canvasback	<i>Aythya valisineria</i>	AYVA1
Canada Goose	<i>Branta canadensis</i>	BRCA1
Bufflehead	<i>Bucephala albeola</i>	BUAL1
Common Goldeneye	<i>Bucephala clangula</i>	BUCL1
Snow Goose	<i>Chen caerulescens</i>	CHCA1
Hooded Merganser	<i>Lophodytes cucullatus</i>	LOCU1
Common Merganser	<i>Mergus merganser</i>	MEME1
VULTURES	CATHARTIDAE	
Turkey Vulture	<i>Cathartes aura</i>	CAAU1
EAGLES & HAWKS	ACCIPITRIDAE	
Cooper's Hawk	<i>Accipiter cooperii</i>	ACCO1
Northern Goshawk	<i>Accipiter gentili</i>	ACGE1
Sharp-shinned Hawk	<i>Accipiter striatus</i>	ACST1
Golden Eagle	<i>Aquila chrysaetos</i>	AQCH1
Red-tailed Hawk	<i>Buteo jamaicensis</i>	BUJA1
Rough-legged Hawk	<i>Buteo lagopus</i>	BULA1
Ferruginous Hawk	<i>Buteo regalis</i>	BURE1
Swainson's Hawk	<i>Buteo swainsoni</i>	BUSW1
Northern Harrier	<i>Circus cyaneus</i>	CICY1
Bald Eagle	<i>Haliaeetus leucocephalus</i>	HALE1
Osprey	<i>Pandion haliaetus</i>	PAHA1
FALCONS	FALCONIDAE	
Merlin	<i>Falco columbarius</i>	FACO1
Prairie Falcon	<i>Falco mexicanus</i>	FAME1
American Peregrine Falcon	<i>Falco peregrinus</i>	FAPE1
American Kestrel	<i>Falco sparverius</i>	FASP1
GROUSE & TURKEYS	PHASIANIDAE	
Wild Turkey	<i>Meleagris gallopavo</i>	MEGA1
Ring-necked Pheasant	<i>Phasianus colchicus</i>	PHCO1
COOTS & RAILS	RALLIDAE	
American Coot	<i>Fulica americana</i>	FUAM1
CRANES	GRUIDAE	
Sandhill Crane	<i>Grus canadensis</i>	GRCA1
SANDPIPERS & ALLIES	SCOLOPACIDAE	
Long-billed Dowitcher	<i>Limnodromus scolopaceus</i>	LISC1
OWLS	STRIGIDAE	
Short-eared Owl	<i>Asio flammeus</i>	ASFL1
Long-eared Owl	<i>Asio otus</i>	ASOT1
Burrowing Owl	<i>Athene cunicularia</i>	ATCU1
Great Horned Owl	<i>Bubo virginianus</i>	BUVI1
SWIFTS	APODIDAE	
Black Swift	<i>Cypseloides niger</i>	CYNI1
TYRANT FLYCATCHERS	TYRANNIDAE	
Cordilleran Flycatcher	<i>Empidonax occidentalis</i>	EMDI1
Willow Flycatcher	<i>Empidonax traillii</i>	EMTR1
SHRIKES	LANIIDAE	
Loggerhead Shrike	<i>Lanius ludovicianus</i>	LALU1

Attachment A
Current Approved Species Code List for Data Entry

COMMON NAME	SCIENTIFIC NAME	SPECIES CODE
TOWHEES & SPARROWS	EMBERIZIDAE: <i>Emberizidae</i>	
Baird's Sparrow	<i>Ammodramus bairdii</i>	AMBA1
MAMMALS		
BATS	ORDER CHIROPTERA	
Small-footed Myotis	<i>Myotis subulatus</i> (=M. <i>ciliolabrum</i>)	MYSU1
Big Brown Bat	<i>Eptesicus fuscus</i>	EPFU1
Hoary Bat	<i>Lasiurus cinereus</i>	LACI1
Little Brown Myotis	<i>Myotis lucifugus</i>	MYLU1
RABBITS & HARES	ORDER LAGOMORPHA	
Black-tailed Jackrabbit	<i>Lepus californicus</i>	LECA1
White-tailed Jackrabbit	<i>Lepus townsendii</i>	LETO1
Desert Cottontail	<i>Sylvilagus audubonii</i>	SYAU1
RODENTS	ORDER RODENTIA	
SQUIRRELS	SCIURIDAE	
Black-tailed Prairie Dog	<i>Cynomys ludovicianus</i>	CYLU1
Eastern Fox Squirrel	<i>Sciurus niger</i>	SCNI1
Chipmunk species	<i>Tamias</i> sp.	
BEAVERS	CASTORIDAE	
Beaver	<i>Castor canadensis</i>	CACA1
AQUATIC RODENTS	MURIDAE	
Muskrat	<i>Ondatra zibethicus</i>	ONZI1
JUMPING MICE	ZAPODIDAE	
Preble's Meadow Jumping Mouse	<i>Zapus hudsonius preblei</i>	ZAHU1
NEW WORLD PORCUPINES	ERETHIZONTIDAE	
Common Porcupine	<i>Erethizon dorsatum</i>	ERDO1
CARNIVORES	ORDER CARNIVORA	
BEARS	URSIDAE	
American Black Bear	<i>Ursus americanus</i>	URAM1
RACCOONS & RINGTAILS	PROCYONIDAE	
Raccoon	<i>Procyon lotor</i>	PRLO1
WEASELS & ALLIES	MUSTELIDAE	
Striped Skunk	<i>Mephitis mephitis</i>	MEME1
Long-tailed Weasel	<i>Mustela frenata</i>	MUFR1
Mink	<i>Mustela vison</i>	MUVI1
American Badger	<i>Taxidea taxus</i>	TATA1
CANIDS	CANIDAE	
Coyote	<i>Canis latrans</i>	CALA1
Common Gray Fox	<i>Urocyon cinereoargenteus</i>	URCI1
Red Fox	<i>Vulpes vulpes</i>	VUVU1
CATS	FELIDAE	
Mountain Lion	<i>Felis concolor</i>	FECO1
Bobcat	<i>Lynx rufus</i>	LYRU1
UNGULATES	ORDER ARTIODACTYLA	
DEER	CERVIDAE	
Elk (Wapiti)	<i>Cervus elaphus</i>	CEEL1
Mule Deer	<i>Odocoileus hemionus</i>	ODHE1
White-tailed Deer	<i>Odocoileus virginianus</i>	ODVI1
Mule X White-tailed Deer	<i>Odocoileus hemionus x virginianus</i>	HEXVI

Appendix B

**Special-Concern Species
Supplemental List**

SPECIES OF PARTICULAR ECOLOGICAL CONCERN AT ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS	FED SENS
RARE AND IMPERILED MAMMALS						
<i>PEROGNATHUS FLAVESCENS RELICTUS</i>	PLAINS POCKET MOUSE SUBSP.	G5TH	SH			
<i>PEROGNATHUS FLAVUS HOPIENSIS</i>	SILKY POCKET MOUSE SUBSP.	G5T?	S1			
<i>PEROGNATHUS FLAVUS SANLUISE</i>	SILKY POCKET MOUSE SUBSP.	G5T?	S3			
<i>REITHRODONTOMYS MEGALOTIS MEGALOTIS</i>	WESTERN HARVEST MOUSE SUBSP.	G5T?	S1			
<i>REITHRODONTOMYS MONTANUS MONTANUS</i>	PLAINS HARVEST MOUSE SUBSP.	G5TH	SH			
<i>SOREX MERRIAM</i>	MERRIAM'S SHREW	G5	S3			
<i>TADARIDA BRASILIENSIS</i>	BRAZILIAN FREETAILED BAT	G5	S1			
<i>THOMOMYS TALPOIDES AGRESTIS</i>	NORTHERN POCKET GOPHER SUBSP.	G5T?	S3			
<i>THOMOMYS TALPOIDES MACROTIS</i>	NORTHERN POCKET GOPHER SUBSP.	G5T?	S1			
<i>ZAPUS HUDSONIUS PREBLEI</i>	PREBLE'S MEADOW JUMPING MOUSE	G5T2	S2	PE	SC	FS
RARE AND IMPERILED BIRDS						
<i>ACCIPITER COOPERII</i>	COOPER'S HAWK	G4	S3S4B,S4N			
<i>ACCIPITER GENTILIS</i>	NORTHERN GOSHAWK	G5	S3B,S4N	(C2)		FS
<i>ACCIPITER STRIATUS</i>	SHARPSHINNED HAWK	G5	S3S4B,S4N			
<i>AMMODRAMUS SAVANNARUM</i>	GRASSHOPPER SPARROW	G5	S3S4B,SZN			
<i>AQUILA CHRYSAETOS</i>	GOLDEN EAGLE	G5	S3S4B,S4N			
<i>ARDEA HERODIAS</i>	GREAT BLUE HERON	G5	S3B,SZN			
<i>ASIO FLAMMEUS</i>	SHORTEARED OWL	G5	S2B,SZN			
<i>ASIO OTUS</i>	LONGEARED OWL	G5	S3S4B,SZN			
<i>ATHENE CUNICULARIA</i>	BURROWING OWL	G4	S3S4B	(C2)		FS
<i>AYTHYA VALISINERIA</i>	CANVASBACK	G5	S2B,SZN			
<i>BUCEPHALA ALBEOLA</i>	BUFFLEHEAD	G5	S1B,SZN			
<i>BUTEO REGALIS</i>	FERRUGINOUS HAWK	G4	S3B,S5N	(C2)	SC	FS
<i>BUTORIDES STRIATUS</i>	GREEN HERON	G5	S3B,SZN			
<i>CALCARIUS ORNATUS</i>	CHESTNUTCOLLARED LONGSPUR	G5	S2B,SZN			
<i>CATHARTES AURA</i>	TURKEY VULTURE	G5	S3B,SZN			
<i>CHEN CAERULESCENS</i>	SNOW GOOSE	G5	S3S4N			
<i>CIRCUS CYANEUS</i>	NORTHERN HARRIER	G5	S3S4B,S4N			

SPECIES OF PARTICULAR ECOLOGICAL CONCERN AT ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS	FED SENS
<i>CISTOTHORUS PALUSTRIS</i>	MARSH WREN	G5	S3B,SZN			
<i>CONTOPUS BOREALIS</i>	OLIVESIDED FLYCATCHER	G5	S3S4B	(C2)		FS
<i>CYPSELOIDES NIGER</i>	BLACK SWIFT	G4	S2B			FS
<i>DENDROICA PENNSYLVANICA</i>	CHESTNUTSIDED WARBLER	G5	S2B,SZN			
<i>DUMETELLA CAROLINENSIS</i>	GRAY CATBIRD	G5	S3S4B,SZN			
<i>FALCO COLUMBARIUS</i>	MERLIN	G5	S1B,S4N			FS
<i>FALCO MEXICANUS</i>	PRAIRIE FALCON	G4G5	S3S4B,S4N			
<i>FALCO PEREGRINUS ANATUM</i>	AMERICAN PEREGRINE FALCON	G4T4	S2B,SZN	LE	T	
<i>GRUS CANADENSIS TABIDA</i>	GREATER SANDHILL CRANE	G5T4	S2B,S4N		T	FS
<i>HALIAEETUS LEUCOCEPHALUS</i>	BALD EAGLE	G4	S1B,S3N	LT	T	
<i>LANIUS LUDOVICIANUS</i>	LOGGERHEAD SHRIKE	G4G5	S3B,SZN			FS
<i>LARUS DELAWARENSIS</i>	RINGBILLED GULL	G5	SHB,SZN			
<i>NUMENIUS AMERICANUS</i>	Longbilled Curlew	G5	S2B,SZN	(3C)	SC	FS
<i>NYCTICORAX NYCTICORAX</i>	BLACKCROWNED NIGHTHERON	G5	S3B,SZN			
<i>PANDION HALIAETUS</i>	OSPREY	G5	S1B,SZN			FS
<i>PASSERCULUS SANDWICHENSIS</i>	SAVANNAH SPARROW	G5	S3S4B,SZN			
<i>PASSERINA CYANEA</i>	INDIGO BUNTING	G5	S3S4B,SZN			
<i>PELECANUS ERYTHORHYNCHOS</i>	AMERICAN WHITE PELICAN	G3	S1B,SZN		SC	
<i>PLEGADIS CHIH</i>	WHITEFACED IBIS	G5	S2B,SZN	(C2)		FS
<i>PODICEPS NIGRICOLLIS</i>	EARED GREBE	G5	S3S4B,SZN			
<i>PORZANA CAROLINA</i>	SORA	G5	S3S4B,SZN			
<i>SAYORNIS PHOEBE</i>	EASTERN PHOEBE	G5	S3B,SZN			
<i>SEIURUS AUROCAPILLUS</i>	OVENBIRD	G5	S2B			
<i>SETOPHAGA RUTICILLA</i>	AMERICAN REDSTART	G5	S1?B,SZN			
<i>SIALIA SIALIS</i>	EASTERN BLUEBIRD	G5	S2B,SZN			
<i>SPIZELLA PUSILLA</i>	FIELD SPARROW	G5	S1B,SZN			
<i>TYRANNUS FORFICATUS</i>	SCISSORTAILED FLYCATCHER	G5	S1B			
RARE AND IMPERILED AMPHIBIANS						
<i>RANA PIPIENS</i>	NORTHERN LEOPARD FROG	G5	S3		SC	FS

SPECIES OF PARTICULAR ECOLOGICAL CONCERN AT ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS	FED SENS
RARE AND IMPERILED INSECTS						
<i>ATRYTONE AROGOS</i>	AROGOS SKIPPER	G3G4	S2			
<i>CELASTRINA SP. 1</i>	HOP-FEEDING AZURE (or HOPS BLUE)	G2	S2			
RARE AND IMPERILED PLANTS						
<i>ARISTIDA BASIRAMEA</i>	FORKTIP THREEAWN	G5	S1			
<i>CAREX OREOCHARIS</i>	MOUNTAIN-LOVING SEDGE	G3	S1			
<i>SMILAX LASIONEURA</i>	CARRIONFLOWER	G5	S3S4			
RARE AND IMPERILED NATURAL COMMUNITIES						
<i>SCOPARIUM</i>	XERIC TALLGRASS PRAIRIES	G2	S2			
<i>ANDROPOGON GERARDII SPOROBOLUS HETEROLEPIS</i>	XERIC TALLGRASS PRAIRIES	G2	S2?			
<i>EXIGUA</i>	PLAINS COTTONWOOD RIPARIAN FORESTS	G2G3	S1			
<i>OCCIDENTALIS</i>	WOODLANDS	G2G3	S1			
<i>STIPA COMATA EAST</i>	GREAT PLAINS MIXED GRASS PRAIRIES	G2	S2			
<i>STIPA NEOMEXICANA</i>	GREAT PLAINS MIXED GRASS PRAIRIES	G2	S2			

Adapted from Colorado Natural Heritage Program 1996 Rare and Imperiled Species lists.

Appendix C

**1997 Preble's Mouse
Monitoring Report**

1997 Study of the Preble's Meadow Jumping Mouse at Rocky Flats Environmental Technology Site

Prepared for

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PTI Contract CBAM-04-01

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INTRODUCTION

This report presents results from Preble's meadow jumping mouse monitoring efforts in Woman and Walnut Creeks at the Rocky Flats Environmental Technology Site (Site) in 1997. Particular attention was paid to the distribution of Preble's mice in Woman Creek with regard to hydrology and vegetation.

Included in this report are summaries from past hydrology reports and Preble's mouse studies at the Site, 1997 study questions, methods, a large-scale description of riparian (stream-side) vegetation within Woman Creek, trapping results from Woman and Walnut Creeks, and habitat characterization in Woman Creek, with special emphasis on hydrology and vegetation. Appendix A describes data management and quality assurance methods. Appendix B contains an explanation of habitat characterization measures and terms.

BACKGROUND AND STUDY SITE DESCRIPTION

PREBLE'S MOUSE BACKGROUND INFORMATION

Site Ecology personnel have been monitoring the resident Preble's meadow jumping mouse (*Zapus hudsonius preblei*) population at the Site for several years. Recently the mouse was listed as endangered by the U.S. Fish and Wildlife Service (Federal Register 63[92]:26517-26530). With the listing, and indications that the subspecies population has declined regionally, it is even more important now to monitor and document populations at the Site. The Integrated Monitoring Plan (IMP) (K-Hill 1997a), provides for annual monitoring of selected portions of known population centers based on relative captures per trap night. Various portions of population centers are monitored each year to assess species stability. The emphasis on Woman Creek in the 1997 monitoring program is discussed in the following section on hydrology.

The locations of Preble's mouse populations within the buffer zone, and the specific vegetation types where they are found, have been the focus of study since 1991, when biologists discovered the Preble's mouse population during a baseline biological characterization (EG&G 1992a). Stoecker (EG&G 1992b) captured Preble's mice on the site in Rock, Walnut, and Woman Creeks. In addition to this information, small-mammal studies conducted at the Site under a previous Ecological Monitoring Program (1993-95) provided indirect information on where Preble's mice are *not* found on the site. No mice were captured in habitat types away from streams (e.g., upland grasslands) in approximately 36,000 trap-nights (DOE 1995; EG&G 1992a,b, 1993; K-Hill 1996a,b).

The locations where Preble's mice were observed on the site were dominated by shrubby vegetation, usually coyote willow (*Salix exigua*), lead plant (*Amorpha fruticosa*) or snowberry (*Symphoricarpos occidentalis*). Based on this information, and the absence of mouse populations in areas away from streams, subsequent sampling concentrated on woody vegetation types within the riparian zone, and little effort has been expended on non-woody (herbaceous) riparian types (DOE 1995; K-Hill 1996a,c). A possible need to refocus these investigations was identified as a result of Preble's mouse studies conducted in Boulder and El Paso Counties, Colorado. These studies identified mouse populations in riparian areas that contain little or no woody vegetation (Meaney et al. 1996, 1997), meaning that further study of non-woody riparian habitats at the Site may aid in understanding onsite population distributions.

During their active period, the Preble's mice at the Site show a strong affinity for riparian areas, apparently because of the availability of surface water or the vegetation cover that water supports, so another avenue of study that may enhance our ability to successfully conserve onsite populations is to characterize onsite population distributions within the context of hydrologic conditions.

For the reasons discussed above, the 1997 monitoring efforts focused on characterizing mouse populations in all riparian vegetation types, and on analyzing hydrologic conditions that support mouse populations. Efforts in 1997 focused primarily on Woman Creek, because 1) Site cleanup and closure activities may affect habitats in the Woman Creek drainage, and 2) because considerable streamflow information is available, including delineation of stream reaches that gain or lose water, either consistently year-round or only during certain seasons.

HYDROLOGY OF WOMAN CREEK

The Woman Creek Drainage Basin extends eastward from the base of the foothills near the mouth of Coal Creek Canyon and flows into Standley Lake. The portion of the basin from the headwaters to Indiana Street (i.e., the portion on DOE property) contains approximately 2,884 acres (WWE 1995) of mostly undeveloped land.

Many man-made structures on- and offsite potentially influence flow regimes in Woman Creek. A number of ditches cross the basin, including the Kinnear Ditch and the South Boulder Diversion Canal to the west, Smart Ditches 1 and 2 to the south, the South Interceptor Ditch to the north, and the Mower Ditch to the east (Figure 1). The Kinnear Ditch diverted water from Coal Creek into North Woman Creek, but recently was replaced by the Kinnear pipeline, which supplies water to wetland restoration projects west of Standley Lake. Neither the South Boulder Diversion Canal nor Rocky Flats Lake has a direct surface connection to Woman Creek, but either may provide additional flow via groundwater (EG&G 1995). Smart Ditch 1 carries water from Rocky Flats Lake, south of Woman Creek, to Ponds D-1 and D-2. Smart Ditch 2 can divert water from Smart Ditch 1 into South Woman Creek. The South Interceptor Ditch (SID) intercepts surface water from the south side of the Industrial Area. The SID diverts this water to Pond C-2, where it is held and occasionally released to Lower Woman Creek after chemical analysis. From 1991 to 1997, the Mower Ditch diverted water from lower Woman Creek offsite to Mower Reservoir, but in August 1997, the diversion structure was improved and set to allow surface water to continue down lower Woman Creek.

Despite these man-made diversions, Woman Creek still exhibits near-natural surface water flows and supports a well-developed riparian vegetation corridor where water is available at or near the surface. The topographic and hydrologic characteristics of the subbasin (i.e., that portion relevant to the Site) vary considerably throughout its length. From a hydrologic perspective, the subbasin can be divided into an upper, central, and lower portion (WWE 1995).

The upper, or western, portion of the subbasin, from near the mouth of Coal Creek Canyon and across the piedmont to just east of the South Boulder Diversion Canal, is relatively flat (1–2 percent slope) and contains no defined stream channels. Precipitation infiltrates quickly through the soil at rates similar to those in the upper portion of the Walnut Creek subbasin (6.0 in./hour initial infiltration rate [WWE 1995]), and little water is available at the surface. There is no woody vegetation in this portion of the subbasin.

Creek channels form in the central portion of the subbasin. This portion contains North and South Woman Creek, the Antelope Springs tributary, the C-1 Pond, and many small groundwater seeps (Figure 1). This portion of the subbasin contains gullies with slopes up to 20 percent and approximately 4 percent channel slopes leading to the main channel of Woman Creek (i.e., confluence of north and south tributaries). Infiltration rates in this subbasin portion are relatively lower than in other portions (WWE 1995), and groundwater exfiltrates to wetland areas and stream channels via seeps (EG&G 1995). Because water is available at or near the surface, riparian vegetation thrives, especially certain shrubs.

The lower portion of the subbasin, from just above Pond C-2 to Indiana Street, consists of broader valleys with about 5 percent side slopes and 2 percent channel slopes. The soils of the lower portion have low to moderate infiltration rates (WWE 1995). Water is less abundant at or near the surface than in the central portion. Shrubs grow in this portion, but they tend to be those species better adapted to dry conditions, such as leadplant (*Amorpha fruticosa*).

From August 1992 to September 1993, an infiltration/exfiltration study was conducted in the central and lower portions of the Woman Creek subbasin, using Cutthroat flumes at 29 stations (EG&G 1995). This study investigated the interactions of surface water and groundwater, and results were used to identify gaining and losing reaches of the stream. A stream reach that is increasing in flow volume as a result of inflow from groundwater is considered to be a gaining reach. A losing reach loses water through infiltration to groundwater.

Stream reaches between the 29 stations were placed in four general classifications: creek gains year-round, creek gains during spring (December through March or April) and loses during the rest of the year, creek loses year-round, or creek experiences a gain for two months or less and loses during the rest of the year (Figure 2).

Results from this study "...generally indicate that Woman Creek gains water from groundwater, particularly during wet spring months, from the western Site boundary to its confluence with the Antelope Springs drainage. Downgradient from the Antelope Springs drainage to the eastern Site boundary, Woman Creek generally loses water through seepage into the valley-fill alluvium" (EG&G 1995). Two exceptions to the general losing reach downgradient from the Antelope Springs are above and below the C-1 Pond. Beyond these points, based on this study, and on hydrologic and observed vegetation characteristics, Woman Creek loses water.

Stream gauge/alluvial-well hydrographs in the 1995 Hydrogeologic Characterization Report (EG&G 1995) illustrate that the central Woman Creek subbasin has greater surface and subsurface water availability than the lower subbasin. This water availability corresponds with the relatively lush stream-side vegetation found in the central reach of Woman Creek. This type of streamside vegetation is recognized as Preble's mouse

habitat at the Site. Therefore, this study was designed to test the relation between Preble's mouse habitat and hydrology.

OBJECTIVES AND STUDY COMPONENTS

The 1997 Preble's meadow jumping mouse monitoring effort focused on gathering data to address three main issues:

- Determine whether mouse populations continue to occupy areas where they have been observed in the past, including upstream of Pond A-1 (Walnut Creek), downstream from the Pond B-4 dam (Walnut Creek), between Ponds C-1 and C-2 (Woman Creek), and downstream from the Operable Unit 5 Landfill (Woman Creek).
- Assess the significance of surface-water availability in the mouse's habitat selection. If populations are not equally distributed among gaining and losing reaches, surface-water availability may be a limiting factor.
- Determine whether the mouse prefers a particular type of riparian vegetation. Previous monitoring focused on woody vegetation. The 1997 sampling studied both woody and herbaceous vegetation types, and was designed to evaluate the assumptions that:
 - Preble's mice occur equally within woody and herbaceous vegetation
 - There is no difference between 1997 and the previous year's habitat characterization variables for successful trap stations

Evidence that these assumptions are not true would indicate that the mouse does prefer one type of vegetation over others.

The 1997 study comprised five components. The first was determining the presence or absence of the Preble's mouse in Walnut Creek. The other four components were all conducted in Woman Creek:

- Describing vegetation distribution in the stream corridor
- Selecting transects
- Trapping small mammals
- Characterizing habitat.

Stream corridor vegetation in Woman Creek was evaluated on the basis of mouse captures in previous studies, correlated with distance from the stream. Transects for 1997 trapping were selected to revisit known population areas and previously untrapped areas

with various types of hydrology and vegetation. Nine transects were run for two sessions (spring and fall). Preble's mouse habitat was then characterized for Woman Creek on the basis of new and existing data.

METHODS AND RESULTS

METHODS FOR CORRIDOR VEGETATION DESCRIPTION

Geographic Information System (GIS) information and capture data were combined to characterize habitat in the Woman Creek corridor at a scale that encompassed the creek drainage within the Site boundary. The characterization was based on distance-from-stream measurements of Preble's mouse captures in past trapping efforts, using grids and an existing Site vegetation community map. The trapping grids covered a range of distances from the stream for Preble's mouse captures. The GIS information from the site-wide Vegetation Types Map (K-Hill 1997b) was used to determine the total acreage of the vegetation types in the riparian zone. This information was converted to percent composition.

Capture data from trapping grids on all three Site streams during the 1995 and 1996 field efforts revealed that 56 percent of Preble's meadow jumping mouse captures occurred within 0–5 m of a stream channel (measured perpendicularly from the stream bank; Table 1, Figure 3). Seventy-three percent of captures were made within 0–10 m, and all captures were made within 35 m of the stream. These three distance ranges (0–5, 0–10, and 0–35 m), were used to describe the vegetation composition of the creek drainage in a pattern of diminishing use (by the mouse) with increasing distance. Arc/INFO™ 7.1 and ArcView™ 3.0 were used to create these corridors from existing digitized data (Figure 4).

The corridor vegetation description was created in 1996 from extensive field surveys to map common plant community types at the Site (Figure 2 in K-Hill 1997b). The smallest polygon in this coverage has a width of 5 m, so this coverage was deemed to be an appropriate scale for this project. For further information on the methods used to create the vegetation map, see Appendix A in K-H (1997b). Additionally, Table B-4 (Appendix B in K-H 1997b) lists these plant communities.

Hydrogeographic data (streams, ditches, and ponds) were taken from a coverage based on aerial photographs made in 1994. A copy of this stream coverage was modified for the purpose of this characterization project. Two rules of thumb were used to determine the stream reaches of Woman Creek to be included:

1. Use only second-order or greater streams
2. Exclude dry gulches.

Second-order streams are defined as stream reaches where two first-order (headwater) reaches come together. Past and current trapping efforts in Woman Creek do not indicate that Preble's mice use first-order streams. Regardless of stream order, channels were

characterized as "dry" if they contained flowing water only during snow or rain runoff events.

Using Arc/INFO™ and ArcView™, corridors of the three different widths—10 m, 20 m, and 70 m—were created as separate coverages. Each width corresponded to three distance ranges of Preble's mouse captures (e.g., 0–5 m = 10 m). Each corridor was centered on the stream channel, and these coverages were overlain on the vegetation coverage to produce three new coverages of only those portions of the vegetation communities that fell within the selected corridors (Figure 4). The total acreages of each of the vegetation communities within each of the corridor widths were calculated and then converted to total percent compositions (Table 2).

CORRIDOR VEGETATION DESCRIPTION

In the Woman Creek 10-m-wide corridor, the three dominant vegetation cover types were leadplant (20%), riparian woodland (19%), and mesic mixed grassland (19%; Table 2, Figure 5). In the 20-m-wide corridor, the dominant vegetation cover types changed proportions: mesic mixed grassland (26%), leadplant (18%), and riparian woodland (16%). Within both the narrow corridors (10 m and 20 m), little difference was apparent among the other cover types along Woman Creek. At the 70-m width, the mesic mixed grassland provided 51% coverage, while all remaining cover types were reduced to 8% or less each.

Trapping efforts for 1997 focused on transects all within 5 m of the Woman Creek stream channel, so additional characterization of the Woman Creek corridor focused on the 10-m-wide vegetation corridor (Figure 6). Considering percent composition of the vegetation within the 10-m corridor, three distinctly different sections were revealed.

Moving from west to east, the first third of Woman Creek, including the main channel and the north and south tributaries, is dominated by mesic mixed grassland and wet meadows (Figure 6). This section has a relatively restricted riparian zone, as determined by the narrow channel, which apparently results from the underlying substrate, given this section's position in the subbasin. Hydrologically, this section is relatively wet and contains gaining and spring gaining stream reaches (Figure 2). Shrubs are present in an almost continuous band within the spring gaining reaches of North Woman Creek, but this band is quite narrow. South Woman Creek has a narrow band of short marsh in the year-round gaining reach.

The second section, where most trapping took place, is surrounded by almost continuous woody vegetation: leadplant, willow, and cottonwood. Woody vegetation, mostly willow and cottonwood, dominates the composition within this section (Figure 6). The main channel is wider in this section and is joined by many groundwater seeps, which create a complex combination of gaining and losing stream reaches (Figure 2), and therefore, inconsistent water availability. Woody riparian vegetation (i.e., willow shrublands)

apparently thrives under these hydrologic conditions, where water is present in large quantities in the spring, followed by a drawdown period (Scott et al. 1993).

The last section, the easternmost third of Woman Creek, lies within a mixture of herbaceous and woody vegetation, with most of the herbaceous vegetation in the reworked Pond C-2/Woman Creek bypass. This section is also dominated by woody vegetation, but instead of willow, leadplant is the dominant shrub. This shrub species is best adapted for drier stream-side conditions, and its presence reflects the losing stream reaches in this section.

Overall, the vegetation communities surrounding the entire main channel of Woman Creek are approximately 51% woody, 23% hydric herbaceous, and 26% mesic to xeric herbaceous (Table 2).

TRANSECT SELECTION FOR SMALL MAMMAL TRAPPING

Eleven sampling areas were selected for Preble's mouse trapping in 1997: two in Walnut Creek, and nine in Woman Creek. The Walnut Creek sampling was strictly for presence/absence determination in previously known population areas: the stream reach upstream from Pond A-1 and the area downstream from Pond B-4 (Figure 1). Areas in Woman Creek were selected for sampling on the basis of previous captures and the desire for more information on distribution and habitat use. Habitat characterization and trapping were conducted on the nine Woman Creek transects.

Areas in Woman Creek were selected based on hydrology; specifically, the Woman Creek Infiltration/Exfiltration Stream Segment Classification (EG&G 1995). This classification scheme divides Woman Creek into five general classifications:

- Stream gains year-round
- Stream gains during spring (4 months or more)
- Stream gains for 2 months
- Stream loses year-round
- Unclassified sections.

Within these classifications, areas of woody vegetation and non-woody vegetation were selected that were large enough to easily encompass the trapping transects. Combining two vegetation types with five stream segment classifications yielded ten transects. However, no unit of sufficient size was found in Woman Creek to represent a stream that gains during spring and has non-woody vegetation. Therefore, nine transects were established based on the remaining combinations. This selection process also met the IMP (K-H 1997a) monitoring requirement of revisiting areas in Woman Creek where Preble's mice had been captured in the past.

SMALL MAMMAL TRAPPING METHODS

Trapping for Preble's meadow jumping mice and other small mammals followed the procedures for small mammals outlined in the *EMD Operating Procedures Manual Volume V* (EG&G 1994) and conformed to the U.S. Fish and Wildlife Service *Interim Survey Guidelines for Preble's Meadow Jumping Mouse* (USFWS 1997).

Animals were trapped in Longworth and Sherman small-mammal live traps using Purina® Sweet Feed as bait. When evidence indicated that raccoons were raiding the traps, raccoons were trapped and relocated within the Site boundaries.

Walnut Creek trapping transects were established using 60 traps set in two rows of 30 traps each, parallel to the stream bed. Walnut Creek monitoring occurred specifically at Z97-04 (upstream of the Pond A-1), and at Z97-42 and Z97-63 (downstream of the B-4 dam) (Figure 1). Trapping began on 7 May and continued until 5 June 1997. Trapping was discontinued once Preble's mice had been captured. Previous efforts indicate that Preble's mice emerge from hibernation and begin their active season (post-hibernation period) during this time frame.

Woman Creek transects contained 50 traps in two rows of 25 each, with both rows parallel to the stream bed. The traps were spaced 5 m apart, with the two parallel rows about 10 m apart. The nine transects were referred to as Z97-64 through Z97-72, with the letter "A" or "B" at the end of the transect name to denote the session (i.e., A for early and B for late). The two trapping sessions—early (3 June to 10 July), and late (12 August to 18 September)—included two 10-day trapping periods, with about half the transects trapped each period. Each transect was run once during each session, for a 10-day period or until 500 trap nights were achieved. This arrangement was used to keep trapping efforts manageable and avoid small-mammal trap mortality. The transects were run in the same order during both sessions (i.e., Z97-64 through -68 for the first 10-day period, then Z97-69 through -72 for the second 10-day period).

Every small mammal captured was identified by species, then aged and sexed. Notations were made concerning evidence of breeding activity, such as lactation or pregnancy in females, or males in breeding condition. Each Preble's mouse was additionally measured for key identifying characteristics, including head and body length, tail length, hind-foot length, and body weight. Digits were checked on each Preble's mouse to determine whether individuals had been marked previously or were new captures. If the individual was marked, the identifying code and the distance traveled since last capture were determined. New Preble's mouse captures were marked by ear punches, or with a food coloring dye.¹

¹ Ear-punch tissues were preserved and sent to the Colorado Division of Wildlife for use in a genetic study. When a sufficient amount of tissue was collected, ear punching was discontinued.

All small mammal data were recorded on approved field data sheets, entered into the Ecology database, verified, and validated (Appendix A). Weather conditions were also recorded at the time the traps were checked.

SMALL MAMMAL TRAPPING RESULTS

This section discusses general results for all small mammal species and results specific to the Preble's mouse population in Woman and Walnut Creeks. Relative abundance is reported as the number of captures divided by the number of trap nights expended, times 100 trap nights, or:

$$(n^c/n^t) \times 100 = \text{Relative Abundance}$$

Where:

n^c = number captured

n^t = trap nights.

All Small Mammal Species

During 11,000 trap nights (Table 3) in Woman and Walnut Creeks, 1,966 small mammals were captured. Of the 10 species represented, two were new at the Site: the long-tailed vole (*Microtus longicaudus*), and a chipmunk (*Eutamias* sp.). Both new species, which are more common in the mountains, were captured in the Woman Creek corridor. In both creeks, deer mice represented the largest percentage (>60%) of the small mammals captured. Walnut Creek species richness was five species, whereas in Woman Creek, the species richness was ten. This reflects the fact that the trapping effort in Woman Creek was ten times greater (Table 3).

The 1997 study efforts in Woman and Walnut Creek added to our understanding of these riparian areas in terms of the small-mammal communities, including the Preble's mouse and its habitat. The long-tailed vole and a species of chipmunk trapped in September are typical of certain montane small-mammal communities. Rocky Flats has long been described as a transition area between the mountains and the high plains, sharing characteristics of both, and these observations attest to this description.

It is interesting to consider how these individuals may have arrived at the Site (assuming that they are new arrivals). One possible explanation is emigration from foothills populations, which would suggest a link to the foothills west of the Site. Animals typically travel along stream corridors, especially when dispersing to new areas. At first glance, no water-way connections to the foothills are apparent, because the Site contains the headwaters of the Woman, Walnut, and Rock Creek drainages. However, as presented in the Background section, the Kinnear Ditch and the South Boulder Diversion

Canal represent possible travel corridors from Coal Creek and Eldorado Springs, respectively.

Preble's Mice

In Walnut Creek, trapping began on 7 May, and two male Preble's mice were captured on 28 May, upstream of Pond A-1, documenting the beginning of the active season (post-hibernation) and confirming the continued presence of Preble's mice at that location. One male was observed in breeding condition. Trapping was discontinued in the Pond A-1 area on 5 June.

No Preble's mice were captured in the spring below the B-4 dam, so a second trapping session was conducted in the fall. During the fall session below the B-4 dam, 200 trap nights were expended from 7 October through 10 October. No Preble's mice were captured (Table 4).

Captures of Preble's mice in Woman Creek were relatively high in 1997 compared to previous efforts (K-Hill 1996a,c; DOE 1995; EG&G 1992b, 1993). A total of 33 captures were made over both trapping sessions (Table 4). The relative abundance of Preble's mice was 0.37 per 100 trap nights. Only 11 individuals captured in Woman Creek were marked; however, minimum and maximum numbers of individuals present can be estimated. The estimated maximum number of individuals is 24, with 9 adult males, 8 adult females, 3 juvenile males, 1 juvenile female, and 3 undetermined. The estimated minimum number, excluding undetermined individuals and assuming that captures of unmarked individuals were recaptures, is 13 individuals (4 adult males, 5 adult females, 3 juvenile males, and 1 juvenile female). With either estimate, the proportion of adult males to females is nearly one to one.

Preble's Mouse Capture Frequency

The frequency of Preble's mouse captures was not constant during the trapping sessions. The peak capture times came at the beginning of the first session and the end of the second session (Figure 7). During the first session, a peak of five captures in one day occurred on 11 June. At the end of the second session, four captures occurred on 17 September, and six Preble's mice were captured on the last day of trapping, 18 September. Thus, trapping success appears to drop off as mid-summer approaches, and rises again in the fall. In Woman Creek, 86% (12 of 14) of the first-session captures occurred prior to 13 June, and 89% (17 of 19) of the second-session captures were made after 8 September. The Woman Creek capture peaks in the spring (first session) occurred in different transects than those in the fall (second session). Although no trapping was conducted from late July through early August, a definite trend is apparent, as illustrated in Figure 7.

Preble's Mouse Distribution

Table 5 summarizes the small-mammal species richness at each transect and indicates whether Preble's mice were present. Tables 6 through 14 present the trapping results by transect. Preble's mice were captured at four of the nine transects in Woman Creek (Z97-67, -68, -71, and -72). All the successful transects were within the middle third of Woman Creek, where groundwater tends to exfiltrate to the creek channel, and consequently, there is a nearly continuous corridor of woody vegetation. Beyond this fact, the presence of Preble's mice did not show a correlation with more specific gaining or losing reaches of Woman Creek. They were captured in year-round gaining, two-month gaining, and losing reaches. Three of the four successful transects were dominated by woody vegetation; one transect, Z97-71, was not. Two of the successful transects had the highest small-mammal species richness (Table 5). However, species richness did not show any discernible correlation with vegetation type, hydrology type, or the presence of Preble's mice.

The small-mammal community within Woman Creek is dominated by deer mice (*Peromyscus maniculatus*) and meadow voles (*Microtus pennsylvanicus*). Transects where Preble's mice were present did not show any small-mammal assemblages that were greatly different from other transects. Preble's mice were captured in association with every other small-mammal species present, including the typical upland species hispid pocket mice (*Chaetodipus hispidus*), and prairie voles (*Microtus ochrogaster*); typical montane species long-tailed vole (*Microtus longicaudus*) and chipmunk (*Eutamias* sp.); and house mice (*Mus musculus*), which are more typically associated with disturbed areas.

The 1997 monitoring results revealed Preble's mice present in Woman Creek and Walnut Creek where they have been captured in the past. One exception is the area of Walnut Creek below Pond B-4. This area had the highest calculated densities anywhere on the Site in 1995 (K-Hill 1996a), but during two 1997 trapping sessions in this area (a total of 1,100 trap nights), no Preble's mice were captured. It would be premature, however, to conclude that this population has been lost or has emigrated from this site. The trapping below the B-4 dam and at Pond A-1 was conducted to determine the beginning of the active season and was discontinued once emergence from hibernation was confirmed. The timing of Walnut Creek trapping, therefore, was sub-optimal in that the mice at the Pond B-4 location may not have emerged from hibernation by the time trapping was discontinued. Further, the early October trapping period is also less than optimal, because previous data indicate that most Preble's mice have already entered hibernation. Also, no habitat has been altered, and with the exception of temporary changes associated with the fall 1997 B-5 outlet works project, water conditions have been constant. For these reasons, the mouse's presence or absence should continue to be monitored in this area, more intensively at optimal times, until the species' status can be determined.

Woman Creek was much more intensively trapped in 1997 than Walnut Creek. Compared with past efforts, results from Woman Creek indicate an increase in the mouse population. Stoecker captured 13 Preble's mice, including recaptures, in August 1992,

expending 2,000 trap nights in Rock, Walnut, and Woman creeks combined (EG&G 1992b). Only two captures in 1992 were from Woman Creek. In 1993, Stoecker captured seven Preble's mice (with recaptures) in Woman Creek after 850 trap nights from 3 June to 12 August (EG&G 1993). This equates to a relative abundance of 0.25 mice per 100 trap nights. In 1994 and 1995, less intensive trapping efforts were made in Woman Creek, and only one individual was captured during these two years (DOE 1995; K-Hill 1996a). Trapping efforts in 1996 produced two individuals—one female (lactating) and a juvenile male—in a new area of Woman Creek (K-Hill 1996c). In 1996, 1,032 trap nights were expended to capture two Preble's mice, for a relative abundance of 0.19 mice per 100 trap nights.

Trapping efforts during these past years have all been different, but results overall indicate relatively low numbers, especially from 1994 through 1996. Estimates of relative abundance from 1993 (0.25 mice per 100 trap nights) through 1997 (0.37 mice per 100 trap nights) do not seem to indicate a great difference. However, in 1993, Preble's mice were captured only in one small area of Woman Creek, while in 1997, they were captured in many different areas within the middle third of Woman Creek (Figure 1, Tables 9–10 and 13–14), suggesting a wider distribution than previously thought. Additionally, increased captures and a higher implied number of individuals this year seem to indicate a slightly growing population. However, this year's trapping effort was more than three times larger than the efforts of past years, and an alternative explanation could be that the more intensive study caught mice that were missed previously, and that the population has maintained steady numbers over time. It is plausible that individuals may have been missed in the past, especially if Preble's mice move within a creek drainage from year to year.

Preble's Mouse Movement

Trapping efforts in Woman Creek documented Preble's mouse movement of over $\frac{3}{4}$ mi. (1.2 km). This was attained by the re-capture of two marked individuals, an adult female and an adult male. Preble's mouse number 100, the only female in Woman Creek marked in 1996 with ear punches, had been captured on 6 August 1996 (and noted as lactating) at the confluence of Woman Creek and the Antelope Springs tributary. She was recaptured on 10 June 1997 at transect Z97-68 (Figure 1), and she was subsequently recaptured in breeding condition and later pregnant. The two locations where she was caught are $\frac{3}{4}$ mi. apart. An adult male Preble's mouse was captured on 10 June 1997 at transect Z97-67 (Figure 1) and ear punched with a distinct pattern. On 25 June, this male was re-captured at transect Z97-72, over $\frac{3}{4}$ mi. upstream.

The movements documented during this study indicate that at least some individuals within the Woman Creek population possess the ability to travel moderate distances to different areas within a creek drainage. This traveling ability was suspected at the Site but had not yet been documented. The female first captured in 1996, then in 1997, was observed in breeding condition and indeed had litters in both locations. Therefore, at least some females have the ability to move to new locations within a creek drainage and

breed. This may be important to breeding success, because females could move to areas with the best breeding and rearing habitat from year to year. It is unknown whether these distances traveled represent the maximum distance, and we can only assume that the route of travel was along the dense shrub cover of Woman Creek. Only radio telemetry of individual Preble's mice can define their traveling ability and range.

These observations support the importance of preserving stream-side vegetation corridors. Movements of individual Preble's mice may play an important role in the survival of local populations. For example, the mice may better utilize scarce food resources by moving to new areas every year. Additionally, the captures of the long-tailed vole and chipmunk may shed light on the dispersal of Preble's mice. The corridor routes potentially used by the vole and the chipmunk could also be used by Preble's mice, possibly linking the Site population to others.

COLLECTING DATA FOR HABITAT CHARACTERIZATION

The primary and secondary habitat types at each of the 450 trap stations (9 transects \times 50 traps) in Woman Creek were determined from a list of 25 gross-level vegetation types (Table B-4, Appendix B). These habitat types correspond to those used on the Vegetation Types Map (K-Hill 1997b). The habitat types at trap stations were determined using a visual estimate of the dominant and secondary vegetation type present. Habitat types were recorded on the first or second day of trapping. Appendix B includes a detailed explanation of each habitat type and the associated codes used throughout this report.

A detailed habitat characterization was conducted subsequently at individual trap stations. No detailed habitat characterization was conducted at Walnut Creek transects. Woman Creek habitat characterization took place in July, between the two trapping sessions. Each of the Woman Creek transects was characterized by 10 trap stations, treated as replicates, for a total sample size of 90. The trap stations used to characterize habitat were predetermined as stations 2, 7, 12, 17, 21, 28, 32, 36, 42, and 46, except where Preble's mice were caught during the first trapping session. At transects where Preble's mice were captured, Preble's mouse capture locations were substituted into the predetermined trap number regimen.

We gathered three different types of habitat information within a 3-m radius (28.3 m²) of the selected trap stations: plant species composition, physical habitat, and vegetation structure. Physical habitat composition measurements are non-vegetative, abiotic features of the habitat. Nine measurements were made of physical habitat. The distance to the nearest tree or shrub canopy was measured. The trap position in relation to the canopy was recorded. Slope aspect, slope angle, slope position, moisture gradient position, and soil type at the trap station were recorded. Distances to the stream and nearest embankment were measured. Table B-3 (Appendix B) lists the habitat endpoints and the methods used to measure the endpoints.

To characterize vegetation structure, the vertical area above the trap station was divided into four strata: trees, tall shrubs, sub-shrubs, and herbaceous plants. The distinction between tree and shrub was determined by height (over 3 m = tree), not by a species' typical growth form (e.g., *Populus angustifolia* is usually a tree, *Salix exigua* is a shrub).

The following vegetation structural measurements were made at each trap station: herbaceous density, tree/shrub canopy cover, visual estimates of basal vegetation, and foliar vegetation cover. All the plant species were recorded at each trap station. In addition, the height of the four tallest individuals within the plot, the number of stems within the plot, the density distribution, and a visual estimate of foliar cover were made for each woody plant species in the plot.

Many of these species-specific variables were measured for the first time in 1997 or were recorded for the first time using cover classes or density distributions. These additional measures were used to refine the characterization of woody vegetation. For example, density distributions were recorded along with stem count classes, providing two data points on the density of specific species at each trap station. A vegetation profile board (1 m² graduated by decimeters; after Nudds 1977), was read at a distance of 10 m to measure vertical vegetation density. A spherical crown densiometer placed 1 m above the ground was used to estimate overall tree/shrub cover. Cover estimates were made using a cover class system (Appendix B). Density distributions were estimated for each woody species present using a density distribution class system, and the stem densities of these species were estimated using a stem density class system (Appendix B).

ANALYSES FOR HABITAT CHARACTERIZATION

Preble's mouse habitat characterization data were analyzed by grouping the trap station habitat data into different categories based on characteristics shared by the various transects (i.e., by woody vs. herbaceous groupings, by hydrotype categories, and by successful vs. unsuccessful groupings), then examining differences between these categories. A summary of transect classifications is presented in Table 15. Again, each transect was represented by 10 characterized trap stations or replicates. A successful transect was one that had at least one Preble's mouse capture during either trap session. Treating an entire transect as successful or unsuccessful was a change from previous habitat characterization efforts (K-Hill 1996a, DOE 1995), where individual trap stations were considered either successful or not, giving little consideration to the habitat contained in the rest of the transect, which may influence capture success.

The successful transects were compared to the unsuccessful transects by looking at the specific measurements made at the selected trap stations. Classification of a transect as either "woody" or "herbaceous" was a subjective, *a priori* assignment made on the basis of the Site vegetation map and visual reconnaissance surveys. Transect classification by hydrotype was based on a previous hydrology study (EG&G 1995).

Important considerations were applied during the analysis of some habitat measures. Cover data were estimated using the following cover classes: r, +, 1, 2, 3, 4, and 5 (see Appendix B). For calculations, the following midpoint values were used: 0.5, 1.0, 3.0, 15, 37.5, 62.5, and 87.5, respectively. Because stem density and density distribution data were gathered using classes that could not be translated into mid-point values, they were tallied by frequency distributions.

Data to be analyzed statistically were first examined for normality and variance differences. Where normality and variance requirements were met, t-tests were used to test the difference between means. In cases where normality and/or variance requirements were not met, Mann-Whitney U tests, Mann-Whitney W tests, and Kruskal-Wallis tests were used to test for differences between medians, as appropriate (Fowler and Cohen 1996; Conover 1971; Manguistics 1994). Statistical analyses not calculated by hand were conducted using Statgraphics Plus software (Manguistics 1994). The Sorenson coefficient of similarity index (Brower and Zar 1977) was used to examine the similarity in species composition (based on presence/absence data) among the different categories of comparison listed above.

As an additional means of comparison, two cover indices were created, one for woody cover and one for herbaceous cover. An index of overall woody vegetation cover was devised to provide an estimate of combined tree, shrub, and sub-shrub canopy cover. The woody index was created by summing the total cover values of the tree, shrub, and sub-shrub layers at each trap station. A total of 300% cover was possible (100% for each layer) at each trap station. The index of overall herbaceous vegetation cover was created by summing the cover values of the graminoid and herbaceous cover types at each trap station, similar to the overall woody index.

HABITAT CHARACTERIZATION

The primary habitat types available to Preble's mice, and the number of captures at the 450 trap stations in Woman Creek, are summarized in Figure 8. Preble's mice were captured most often (22 of 33 captures; 67%) in willow shrub habitat, which was the most available habitat (112 of 450 trap stations; 25%). Other habitat types that also made up a large portion of available habitat (i.e., short marsh, leadplant shrub, and wet meadow) were used by Preble's mice, but not to the degree that willow shrub habitat was used (Figure 8). If Preble's mice had been using the habitat types equally, the captures among habitats would be distributed according to habitat availability. This was not the case, in that willow was used more than other available habitats (i.e., 67% captures in 25% of the available habitat). Where Preble's mice were captured in cottonwood riparian habitat, the secondary habitat was always willow shrub. Additionally, willow shrub habitat typically contained secondary habitats of bare ground, litter, snowberry shrub, or leadplant shrub.

Confirmation of Transect Designations

A priori designation of transects as woody or non-woody (Table 15) was confirmed by habitat characterization. Although many different habitat measures were taken, only those that are applicable to discerning woody vegetation from non-woody vegetation are presented here. Transects designated as woody have high values of the woody vegetation measurements used in the habitat characterization. Woody sites also have higher herbaceous vegetation values as well. Results showed significant differences in herbaceous density, tree/shrub canopy cover, and the woody cover index values between the woody and herbaceous transect categories.

Four of the habitat measures taken at trap stations—the herbaceous density board measure, the spherical densiometer measure, and the two visual cover indexes—were used to quantify the amount of woody and herbaceous vegetation in the transects. Herbaceous density, as measured with the density board (see methods section), was found to be significantly greater in the woody versus the herbaceous transects (77% and 40%, respectively; Table 16; Mann-Whitney U test = 192, $P < 0.05$). Tree/shrub canopy, as measured with a spherical densiometer, was significantly higher in the woody versus the herbaceous transects (29% and 1% cover, respectively; Table 16; Mann-Whitney U test = 340, $P < 0.05$). The woody cover and herbaceous cover indices were both significantly different for woody versus herbaceous transects (72% and 15%, respectively, for woody cover; Table 16; Mann-Whitney U test = 134, $P < 0.05$ and 52% and 83%, respectively, for herbaceous cover; Table 16; Mann-Whitney U test = 495, $P < 0.05$).

Comparison of Successful and Unsuccessful Transects

Four of the nine transects were successful capture sites for Preble's mice. Of these four, three were categorized as woody and one as non-woody (Table 15).

Vegetation Species Composition

Total species richness of plants was higher at unsuccessful transects than at successful transects (173 and 133 species, respectively; Tables 17 and 18). On a per-trap-station basis, average species richness did not differ significantly between the unsuccessful and successful transects (25.82 and 26.58 species, respectively; Table 16). Characterization of plant species lists by percent native species and percentage of wetland indicator species showed little difference between successful and unsuccessful transects (Table 17 and 18).

Vegetation Structure

Herbaceous density was found to be significantly greater in the successful transects than in the unsuccessful transects (72% and 51%, respectively; Table 16; Mann-Whitney U

test = 552, $P < 0.05$). Tree/shrub canopy revealed significantly higher values for the successful transects than the unsuccessful transects (24% and 10% cover, respectively; Table 16; Mann-Whitney U test = 628, $P < 0.05$). The woody cover index also was significantly greater at the successful transects than at the unsuccessful transects (67 and 31 respectively; Table 16; Mann-Whitney U test = 436, $P < 0.05$). No significant difference was found between the overall herbaceous cover index of the successful and unsuccessful transects (Table 16).

Litter cover was significantly higher at the successful than at the unsuccessful transects (32% and 18% cover, respectively; Table 16; Mann-Whitney U test = 654, $P < 0.05$). No significant differences were found among the basal vegetation cover, rock cover, soil cover, or water cover between successful and unsuccessful transects (Table 16).

Foliar cover amounts by species were averaged over all sampled trap stations for each type of transect (successful or unsuccessful) to provide an average amount of foliar cover by species, because every woody species did not occur at every sampled trap station. At successful transects, the greatest amounts of woody foliar cover were provided by coyote willow (38%), leadplant (19%), and cottonwood (*Populus deltoides*; 6%; Table 19). At unsuccessful transects, the greatest amounts of woody foliar cover were provided by leadplant (20%), coyote willow (10%), and cottonwood (7%; Table 19).

The woody species leadplant, coyote willow, and snowberry had the highest stem densities and frequency of occurrence at both successful and unsuccessful transects (Table 20 and 21). No mean stem densities are reported, because the density data were gathered in density classes (see Appendix B for the stem density class categories used). Species densities relative to one another were inferred by frequency of occurrence in density classes. At successful transects, leadplant and coyote willow occurred at 95% and 90% of the trap stations characterized, respectively, but coyote willow occurred at higher densities than did leadplant (Table 20). At unsuccessful transects, both leadplant and coyote willow were less common, occurring at only 50% and 26% of the trap stations characterized, respectively (Table 21), but leadplant occurred at higher densities at unsuccessful transects than did coyote willow (Table 21).

Density distributions that provided a measure of the spatial arrangement of woody species at trap stations revealed that coyote willow occurred at successful transects in clumped to solid stands, whereas at unsuccessful transects, it occurred more as individuals or clumps (Tables 22 and 23; see Appendix B for visual representations of the classes). At successful transects, leadplant was found predominately in clumps, whereas at unsuccessful transects, it ranged from individuals to nearly solid stands (Tables 22 and 23).

Chokecherry shrubs were significantly taller (mean = 124.38, successful; mean = 46.75, unsuccessful) at successful transects than at unsuccessful transects. No other trees or shrubs showed a difference in height (Table 24).

Characterization of Successful Trap Stations

The physical characteristics of the successful trap stations were analyzed separately, as had been done in previous years, to provide continuity of capture location data. All physical parameters measured at successful trap stations fell within previously measured ranges from past years' habitat characterization results (Tables 25–28, Figure 9). In 1997, all captures in Woman Creek occurred on slopes of less than 10° (Table 26) and at the riparian and bottom slope positions (Table 27). Sixty percent of the captures occurred within 5 m of an embankment, and none occurred beyond 20 m from an embankment (Table 28).

Trap station (microsite) vegetation variables measured in 1997 provided additional measurements not previously collected. Table 25 shows the expanded range of measurements from 1997 compared to previous years. These included stem density, tree and shrub density distributions, tree and shrub cover, and other cover types. Furthermore, species-specific measurements of these variables demonstrate the robust nature of willow shrubs (Table 25, *Salix exigua*) in Woman Creek, with stem density, density distribution, and foliar cover values relatively high or at the upper range of the measurement class systems.

DISCUSSION OF HABITAT CHARACTERIZATION

Results of habitat characterization provide additional confidence in describing Preble's mouse habitat in Woman Creek by supporting past findings and revealing habitats that are seldom if ever used by the species. Physical parameter measurements from successful trap stations in 1997 were all within previously measured ranges (Table 25). Vegetation measures for successful trap stations were similar to past measures, but the range of values for many measures expanded with the addition of 1997 data. Trapping transects were set up to sample only the riparian zone, so only this slope position and short distances to the stream were monitored. Information on typical slope position and distance from the stream selected by Preble's mice is presented in K-Hill (1996b).

A change this year was to classify an entire transect as "successful" if it contained at least one trap station with a Preble's mouse capture. Successful transects had significantly higher herbaceous density, tree/shrub canopy cover, and woody cover index values than unsuccessful transects, which would indicate a preference of the Preble's mouse for stream-side areas that have thicker, more extensive vegetation cover. Woody species foliar cover measures revealed that, while successful transects had nearly four times the foliar cover of coyote willow than unsuccessful transects, leadplant amounts were essentially the same at both (Table 19). Coyote willow occurred at somewhat higher stem densities and provided more of a continuous cover at successful transects than did leadplant, which had lower stem densities and tended to have more of a clumped distribution (Tables 20–23). Therefore, while leadplant was present in the same amounts at both successful and unsuccessful transects, the higher cover and stem density, and more continuous cover of coyote willow at successful transects in Woman Creek in 1997

continues to support the idea of coyote willow as an "indicator" of potential Preble's mouse habitat at the Site. Of the remaining habitat measures (number of plant species per transect, basal vegetation cover, litter cover, rock cover, soil cover, and water cover), only litter cover showed any significant difference from previous years. Litter ground cover may be important as nesting material, but is most likely only a reflection that Preble's mice inhabit thickly vegetated areas that produce a large amount of litter. The 1997 habitat characterization results from Woman Creek verify the findings of previous years, underscoring basic assumptions about Preble's mouse habitat requirements at the Site.

The lack of significant differences for many of the data variables between successful and unsuccessful transects would probably support a reduction in the number of parameters measured, and field efforts could be focused on measuring those parameters that provide the most important information. So doing would increase efficiency in the field and reduce the amount of redundant data collected.

Three parameters were measured during 1997 (herbaceous density, tree/shrub canopy cover, and woody cover index) to indicate the density or cover of the vegetation at the trap stations. All three measures showed significant differences between the successful and unsuccessful transects (Table 16). To determine which measure would be the most appropriate for future use, a Spearman Rank Correlation test (Manugistics 1994) was conducted on the data. Results showed modest to strong correlations between all three measures (Table 29), with the strongest correlation between the tree/shrub canopy cover, as measured with a spherical densiometer, and the woody cover index, provided by summing the visual estimates of cover for sub-shrub, shrub, and tree canopy layers in the trap station plot ($r_s = 0.7429$; $P < 0.001$). Measuring woody cover with a spherical crown densiometer is a more quantitative, less subjective measure than the woody cover visual estimates. Based on this information, the spherical densiometer should be used rather than the woody cover index. Of the other cover parameters measured (basal vegetation cover, litter cover, rock cover, soil cover, and water cover), the only parameter that showed any significant difference was litter cover. Therefore, it would be appropriate to discontinue the other cover measures, because they have shown no difference with respect to Preble's mouse captures.

The high similarity of plant species composition between successful and unsuccessful transects, based on the Sorenson coefficient of similarity index (Table 30), would seem to indicate that attempting to use particular species or groups of species as indicators of Preble's mouse presence in Woman Creek is probably not very useful. The high similarity of species composition and small difference in the number of species present at different locations throughout the Woman Creek drainage indicate a fairly uniform species richness along the length of Woman Creek within the Site boundary. More important is the cover of the predominant shrub species, especially coyote willow. While species richness is important as an indication of vegetation species presence, and somewhat of habitat quality, comparisons of the number of species per trap station and similarity indices showed that these measures were not useful for predicting Preble's mouse presence or absence.

The relations shown for successful versus unsuccessful transects also held true for woody transects (woody and herbaceous transects were classified *a priori* as woody or herbaceous). Woody transects had significantly higher herbaceous density, tree/shrub canopy, and woody index values than the herbaceous transects (Table 16), which makes sense. However, despite previous results from successful transects that showed significantly higher woody cover and density than unsuccessful transects, not all successful transects were woody (Table 31). Of the five transects classified *a priori* as woody (Z97-65, Z97-67, Z97-68, Z97-70, and Z97-72), only three were successful (Z97-67, Z97-68, and Z97-72). Of the two woody transects that were not successful (Z97-65 and Z97-70), the classification of Z97-70 as woody could be questioned, because it was intermediate between woody and herbaceous with respect to its overall woody index value (44.1; Table 31). Therefore, perhaps its woody cover was below some threshold value that the mice prefer in terms of cover provided. Additionally, Z97-70 is a relatively dry transect, as indicated by the lack of water observed during field work and the composition of the shrubland. This area is a nearly continuous corridor of moderately dense leadplant with an understory of mesic grassland species. Perhaps this area is too dry to support Preble's mice. The other unsuccessful woody transect (Z97-65) had a high woody index value (78.95; Table 31), which was as high as the other woody classified transects. This transect was the farthest upstream of all the woody transects and, in terms of water availability, seems comparable to transects farther downstream that support Preble's mice.

One possible explanation for no Preble's mouse captures here is that this transect might be somehow isolated from the Preble's mouse population centers lower in the drainage, because the stream channel has been altered just below this transect. In this section of Woman Creek, water has been diverted from the natural channel to a straight ditch. Both the ditch and most of the old channel lack substantial woody cover. The lack of cover may be so extensive as to prevent Preble's mice from traveling through this section of Woman Creek. Transects downstream from this creek section are connected with corridors of continuous shrubs, and only small "gaps" exist in herbaceous vegetation types, as revealed by the corridor habitat description.

Telemetry studies would provide additional information on Preble's mice movements, indicating the size and types of "gaps" or barriers they are willing to cross and better characterizing the distances traveled by individuals. Finally, if Preble's mice are able to travel along relatively long corridors with little cover, another explanation for the lack of populations at the remaining woody transects may be simply that not all the available habitat is occupied. If more habitat exists than is occupied in Woman Creek, then the population has room to expand, and availability of some other requirement may be limiting the growth. One possible limiting factor might be the availability of hibernation sites.

Correlation of Hydrology to Preble's Mouse Distribution

Habitat characterization measures were analyzed among hydrotypes to assess the correlation between Preble's mouse distribution and hydrotype. After initial analyses showed no differences between measured parameters based on preliminary hydrotype classifications, hydrotype categories were reassigned so measured parameters could be compared to gaining or losing categories, based on field experience during the summer of 1997 (Table 15). Spring gaining transects, gaining transects, and the unknown transect Z97-66 were reassigned as gaining reaches. Two-month gaining transects, losing transects, and unknown transect Z97-70 were reassigned as losing reaches. The gaining and losing categories were then assigned woody and herbaceous status based on their previous categorization. This process resulted in four categories: herbaceous gaining, herbaceous losing, woody gaining, and woody losing (Table 15). The habitat characterization measures were then reanalyzed using these four categories. Habitat measures among these transects using reassigned categories (or original categories) did not show any significant differences.

The species-specific foliar cover amounts and stem densities for coyote willow and leadplant were somewhat higher in the woody losing reaches than in the woody gaining reaches (Tables 33–35). This was unexpected, on the basis of the assumption that the gaining reaches would have the greatest shrub cover and density. One possible explanation is that the woody gaining reaches had too much available water for optimal shrub growth. Stem heights were not significantly different for these species, however, between the woody gaining and woody losing reaches. The same pattern of higher cover and stem densities of coyote willow and leadplant was observed in the herbaceous losing versus herbaceous gaining reaches, with the losing reaches having the greater amounts. In general however, no striking differences were noted between woody gaining and woody losing reaches, or herbaceous gaining and herbaceous losing reaches of the stream.

The information above supports a conclusion that little difference was observed in the habitat in Woman Creek that could be attributed to variations in hydrologic characteristics. A likely explanation is that the scale at which the sampling occurred (i.e., lumping all 10 trap stations at a given transect) was probably too large to separate out the micro-scale vegetation requirements that account for the smaller-scale distribution patterns of the woody species seen in the Woman Creek riparian zone. Micro-scale differences in stream and groundwater flow through the variable alluvial deposits beneath the stream and stream-side terraces most likely account for the micro-scale differences in vegetation along the stream. Therefore, a much finer-scale sampling design would be needed to evaluate these differences. However, because trapping results have shown that the Preble's mouse crosses these micro-scale differences, there would be little practical value in doing such a study (i.e., micro-habitat factors that influence woody species distribution may not be practically relevant to predicting Preble's mouse distribution).

Preble's mouse distribution in Woman Creek might still be predicted by water availability. However, hindsight and the further understanding gained from this study indicate

that gaining and losing reaches of a stream may not equate to water availability. The mouse may only need water (e.g., late-season pools) within a certain distance of suitable habitat. Conversely, water may not be required directly by Preble's mice and may only be needed indirectly as it supports adequate herbaceous or woody cover and food. Like deer mice, Preble's mice may meet physiological water requirements through various foods or dew, or they may have a need to drink free water during all or part of their active season. Currently, no research exists about the specific physiological water requirements of Preble's mice.

COMBINED INFLUENCE OF HYDROLOGY AND OTHER HABITAT FEATURES

Perhaps examining a number of factors at slightly different scales can predict Preble's mouse distribution in Woman Creek. Based on current and past-year habitat characterization, Preble's mice prefer areas within the riparian corridor that have high woody and herbaceous cover. Shrub cover provided by coyote willow appears to be preferred, and areas with only herbaceous cover, whether relatively wet or mesic, tend to be avoided. Stoecker researched this same habitat selection as it related to Preble's mice in spring and early summer (EG&E 1993). After trapping and characterizing four habitat types in Woman and Rock Creeks, he observed an affinity of Preble's mice for willow shrub habitat, although he spent a disproportionate time (i.e., trap nights) in wet meadow habitats. Stoecker captured 16 Preble's mice in willow habitat and none in wet meadow.

Results of this study indicate that hydrology at the transect level (approximately 150 m long) does not seem important to the distribution of Preble's mice. However, the relation of losing reaches to water availability remains unclear. Water may still be present at or near the surface throughout a losing reach, or it may disappear entirely, becoming unavailable to plants or Preble's mice.

Alternatively, an examination of hydrology and vegetation together at a larger scale in Woman Creek does reveal some coarse patterns of distribution. Hydrology studies at the Site have divided the Walnut and Woman Creek subbasins into three distinct portions: upper, central, and lower. Soils in the central portion exhibit low water infiltration rates, and slopes in this portion are steeper. Both features equate to more water availability at or near the surface of the creek channel (WWE 1995). Despite the fact that the creek channels may be dry during some portions of the summer, water is maintained relatively close to the surface compared to other portions of the subbasins. Apparently, adequate water is available for willow shrubs, and the central portion of Woman Creek tends to have high woody cover provided by willow. Variations within this central portion, as dictated by small-scale gaining and losing reaches, are unimportant, because Preble's mice can travel through them to more suitable areas.

Vegetation descriptions at a scale that encompasses the entire Woman Creek drainage and most of the subbasin reveal similar patterns. As previously mentioned, the central and lower subbasins, where riparian vegetation occurs, can be divided into three areas based on vegetation cover. Cover in the western third of the main channel is dominated

by herbaceous vegetation and a thin band of woody vegetation. Water flows are nearly constant, but fairly low in volume. The vegetation in this upper portion of the subbasin reflects these conditions, in that wetland plants that have adapted to inundated conditions exist in constant low-flow areas (South Woman Creek), and in a narrow band of woody vegetation where conditions vary seasonally. Plant composition in the easternmost (lower) third of the main channel is a mixture of herbaceous and woody cover. Vegetation in the lower third reflects relatively dry conditions, in that leadplant constitutes most of the shrub cover. The middle third contains the most woody cover in a nearly continuous corridor of woody vegetation, with coyote willow providing the most shrub cover. Water flows are quite variable in this section, as reflected in the many gaining, partially gaining, and losing reaches (Figure 2). Coyote willow thrives in these conditions. It is in this middle third of Woman Creek where every Preble's mouse has been captured, although trapping efforts in the remaining areas have not been as extensive in 1997. Stoecker (EG&G 1993) investigated the upper and lower thirds of Woman Creek and found no Preble's mice.

SUMMARY AND CONCLUSIONS

Overall, the 1997 monitoring effort confirmed the presence of Preble's mouse populations where they had been found previously: in Walnut Creek upstream from Pond A-1, and in Woman Creek from the area downgradient of the Operable Unit 5 landfill to ¼ mile upstream from Pond C-2. The exception to this trend was the portion of Walnut Creek downstream from the B-4 dam, where no mice were captured this year. However, the trapping in Walnut Creek was conducted at sub-optimal times, and given the rarity of the mouse, no conclusion can be drawn as to the presence or absence of the population observed in this area in previous events. This area of Walnut Creek should continue to be monitored annually, with increased intensity, until data are sufficient to reach such a conclusion.

The habitat characterization conducted in 1997 confirmed the findings of previous studies: Preble's mice are found in areas of thick herbaceous and woody vegetation, especially where coyote willow is present, and they avoid herbaceous vegetation that lacks woody cover. In Woman Creek, mice were captured only in the middle third, where their preferred habitat prevails.

Hydrologic characteristics were not found to correlate directly to the presence or absence of Preble's mice, except to the extent that hydrology influences vegetation types. Water availability along the creek follows a gradient from the upper section, where water is almost always present, to the lower section, where water is hardly ever present. Therefore, plants that can tolerate constant water (herbaceous wetlands) are found in the upper section, and plants that can tolerate dry conditions (leadplant) are found in the lower section. Plants (including coyote willow) that adapt to changing hydrologic conditions (flooding and drawdown) thrive in the middle section, regardless of whether a particular stream reach is classified as gaining or losing, and these plants constitute the habitat favored by the Preble's mouse.

One important result of the 1997 study is documentation of Preble's mice traveling ¾ of a mile (1.2 km) or more. At least some individuals within the Woman Creek population possess the ability to travel moderate distances, and the female observed in this study was able to move to a new location and breed there. It is not known whether the travel distance observed in this study represents the maximum distance over which the mouse is capable of moving, but it can be surmised that the route of travel was along the dense shrub cover of Woman Creek.

While the habitat characterization results helped reinforce some previously held views (i.e., Preble's mice apparently prefer areas of heavy woody and herbaceous cover close to water), and habitat usage has become better refined (i.e., areas of moist or wet vegetation lacking a woody component seem to be avoided), many questions still remain as to the

precise habitat requirements of the Preble's mouse in Woman Creek. The lack of detailed information on the food requirements of the species, and the lack of information pertaining to Preble's mouse movements within the riparian/grassland corridor, limit understanding of the mouse's habitat requirements.

RECOMMENDATIONS

Future work should focus on telemetry studies, which would allow for tracking actual movements of the mouse within the riparian corridor, and would help provide information on seasonal use of the riparian/grassland corridor, home range, hibernaculum sites, and possibly, food sources. With this type of detailed information, a much better understanding of the daily and seasonal requirements of the mouse could be gained. Further refinement of habitat requirements and usage could then be practically applied to predicting potential impacts from ongoing cleanup and normal work activities at the Site.

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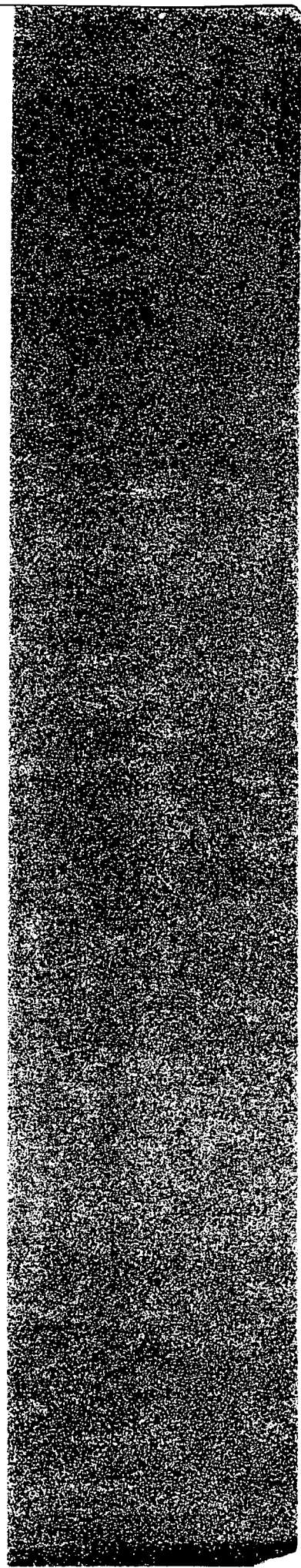
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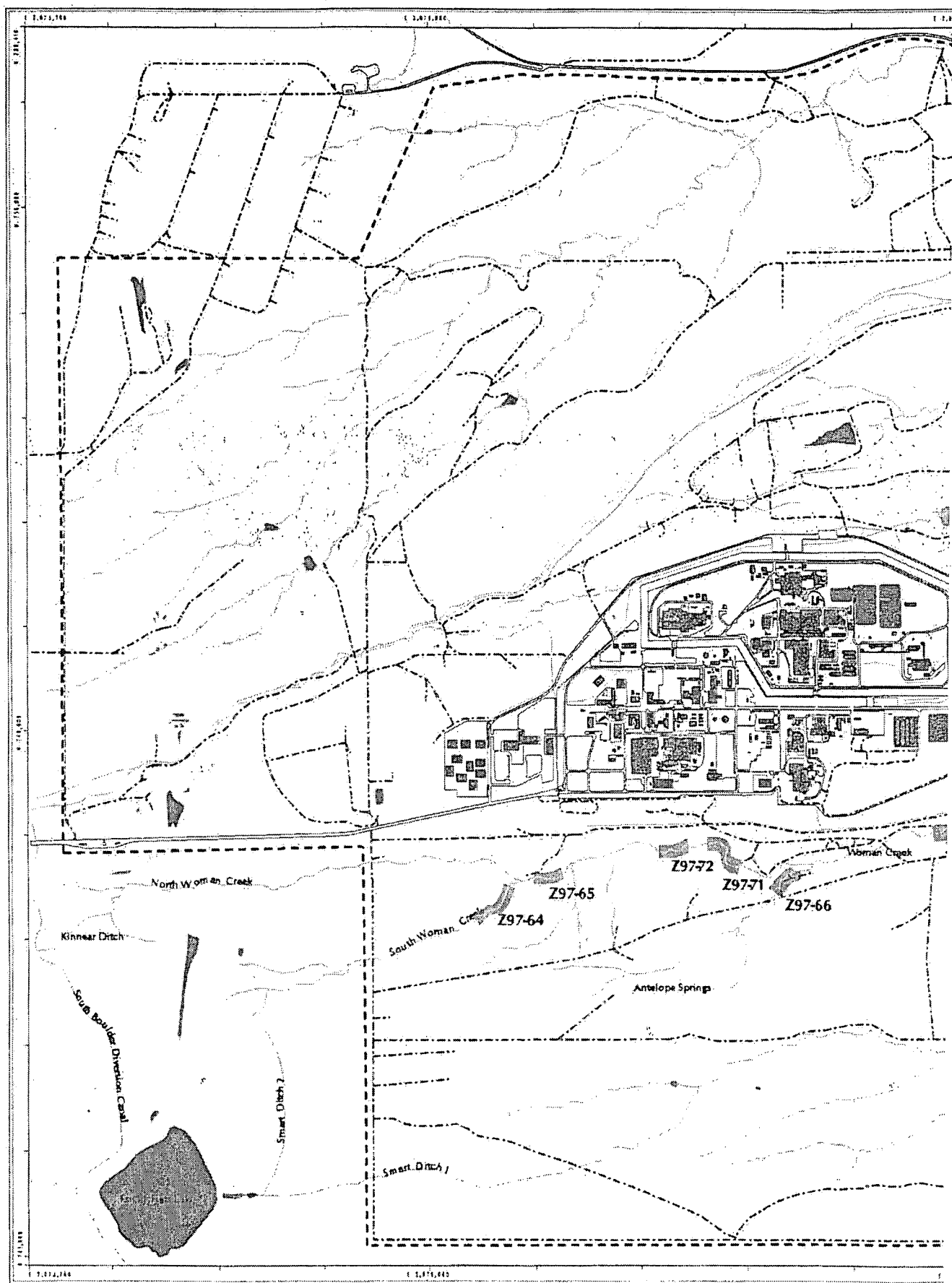
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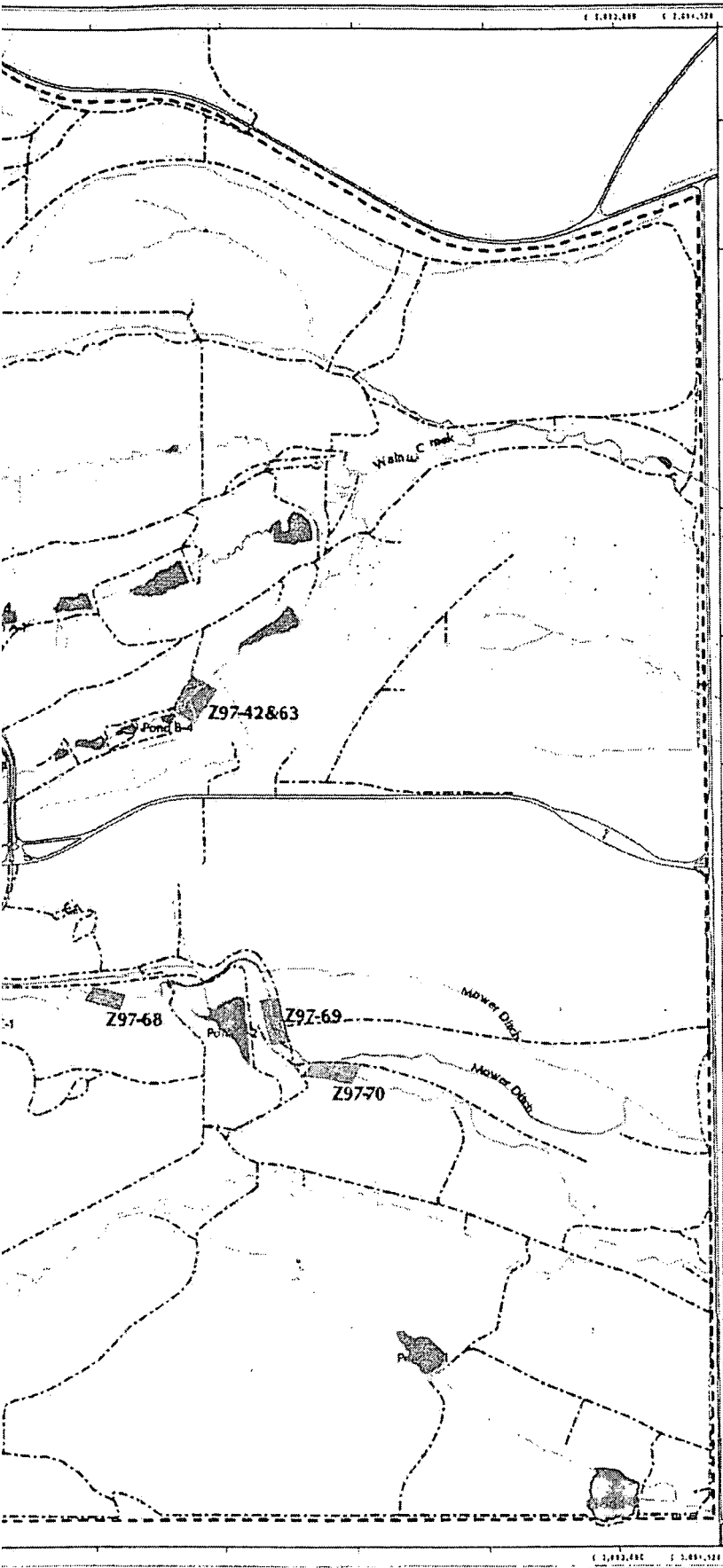
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Figures







Locations of Preble's Meadow Jumping Mouse Trap Sites, 1997

Figure 1

LEGEND

- 1997 Sample sites
- Buildings and other structures
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences
- Rocky Flats boundary
- Paved roads
- Dirt roads

DATA SOURCE:

Preble's meadow jumping mouse data provided by PTI Environmental Services Ecology Group - 1997.

NOTE:

These are Preble's meadow jumping mouse successful and non-successful trapping locations for spring 1997. This map is not to be interpreted as a Preble's meadow jumping mouse habitat map.



Scale = 1 : 21330
1 inch represents approximately 1778 feet

500 0 1000 2000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

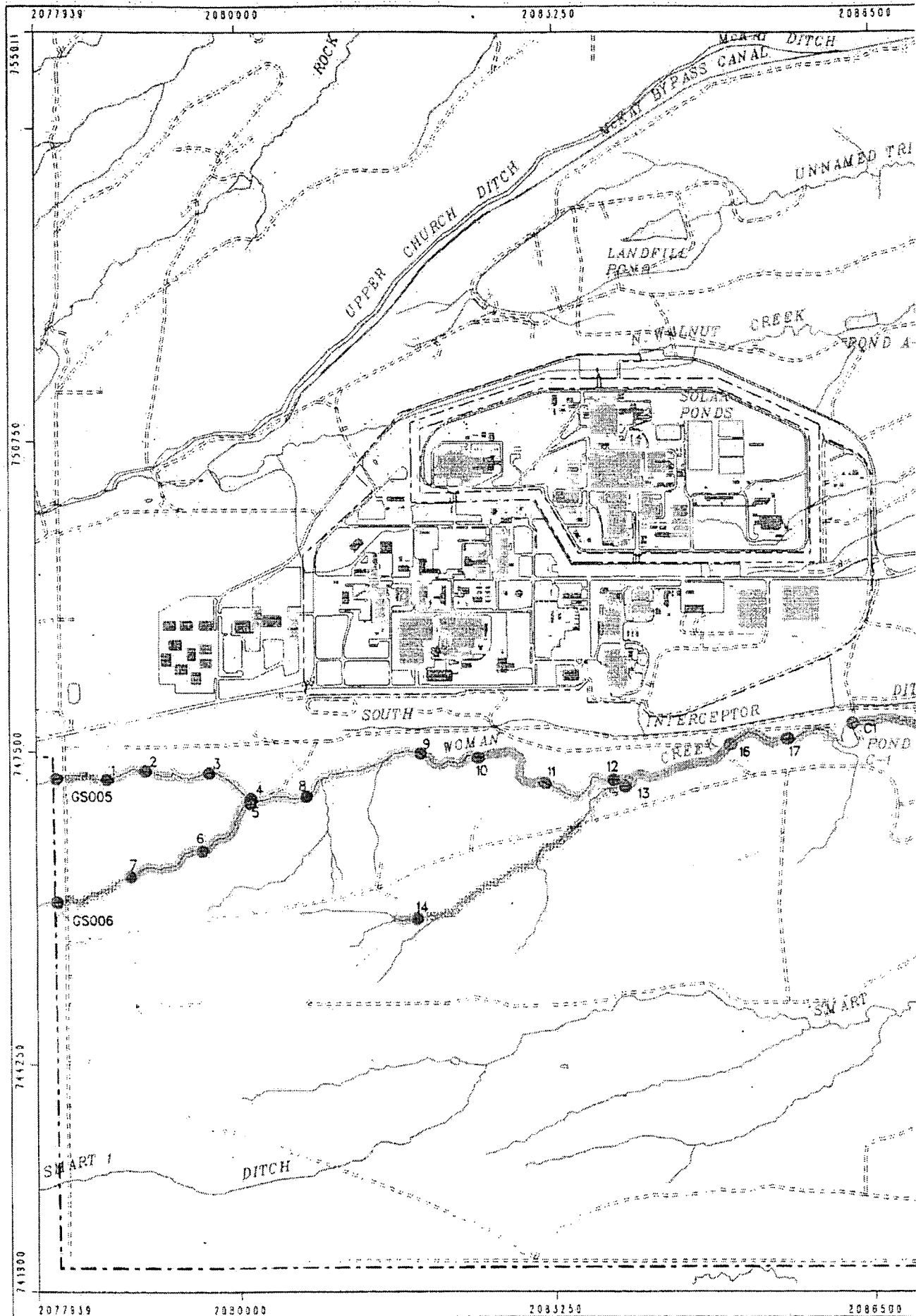
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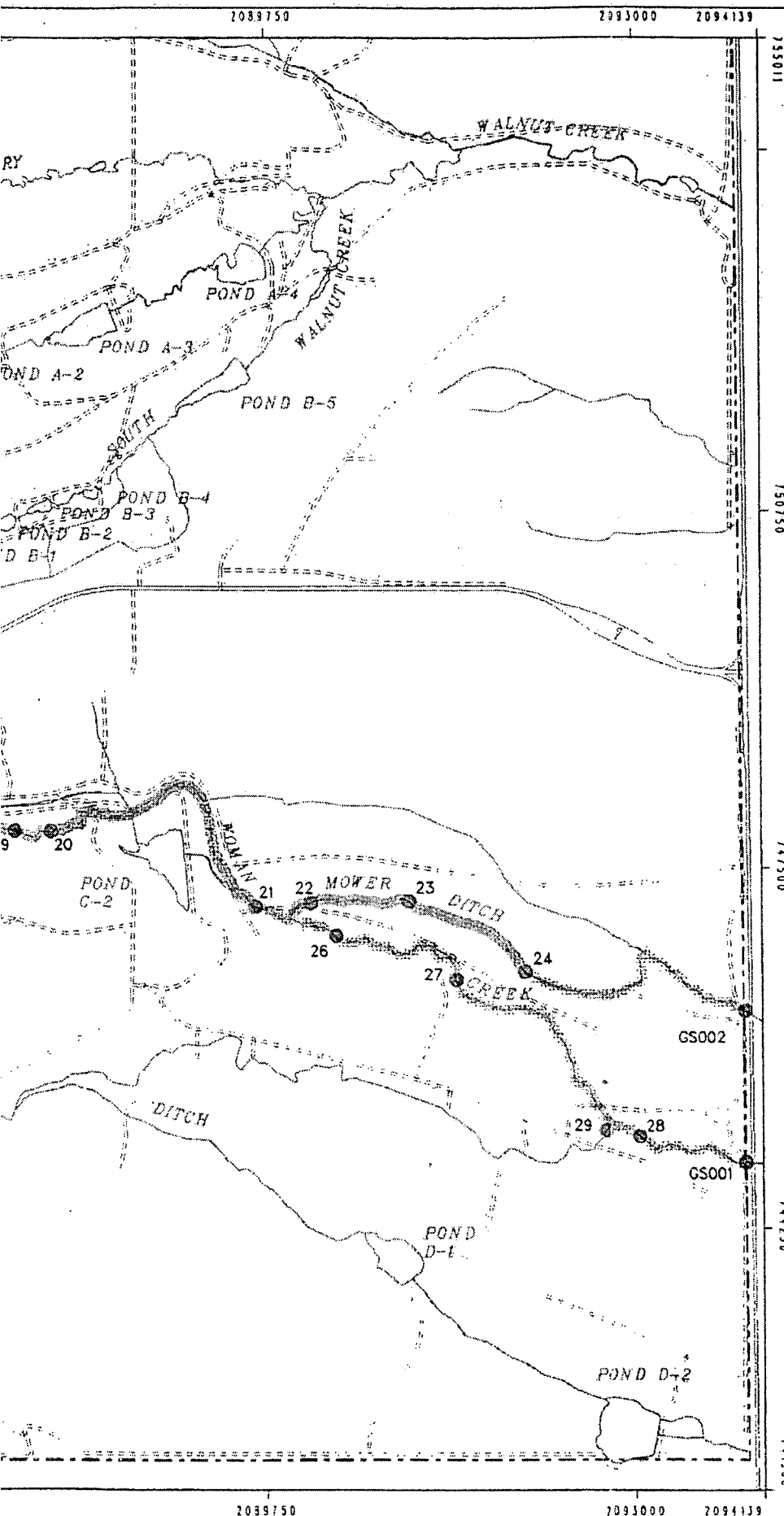
PTI ENVIRONMENTAL SERVICES

MAP ID: 'p028-002'

December 08, 1997

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EXPLANATION

General Segment Classification

- Stream Gains Year-Round
- Stream Gains During Spring (December - March or April) Loses Rest of Year
- Stream Loses Year-Round
- Stream Experiences a Gain For 2 Months or Less During Year, Loses Rest of Year
- Creek Not Classified Due to Inadequate or Uncalibrated Data

Measurement Location

Surface Water Impoundments

Buildings

Streams and Drainages

Paved Roads

Dirt Roads

Rocky Flats Plant Site and Security Zone Boundaries

Rocky Flats Site Boundary



Scale = 1 : 16200
1 inch = 1350 feet



State Plane Coordinate System
Colorado Central Zone
Datum: NAD27

EG&G ROCKY FLATS

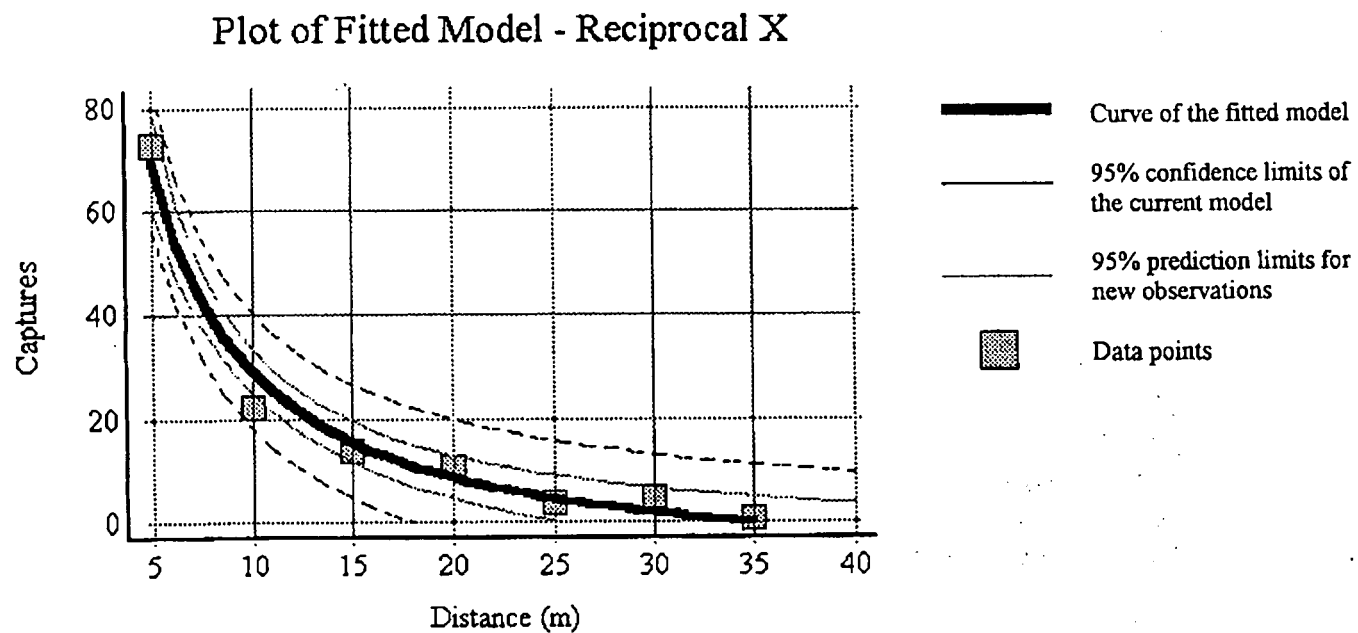
Rocky Flats Site, Golden, Colorado

Woman Creek
Infiltration/Exfiltration
Stream Segment Classification

Hydrogeologic Characterization Report

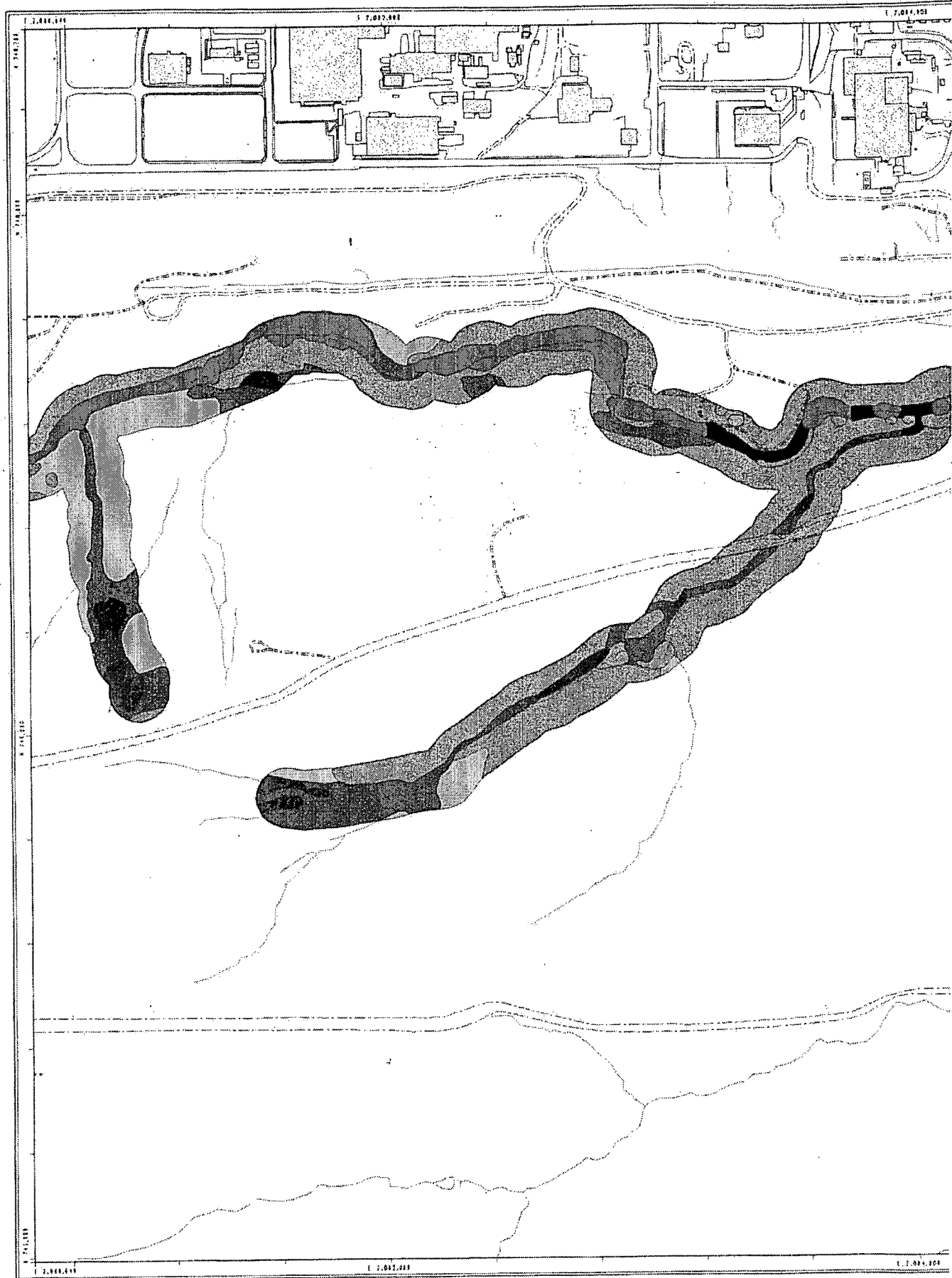
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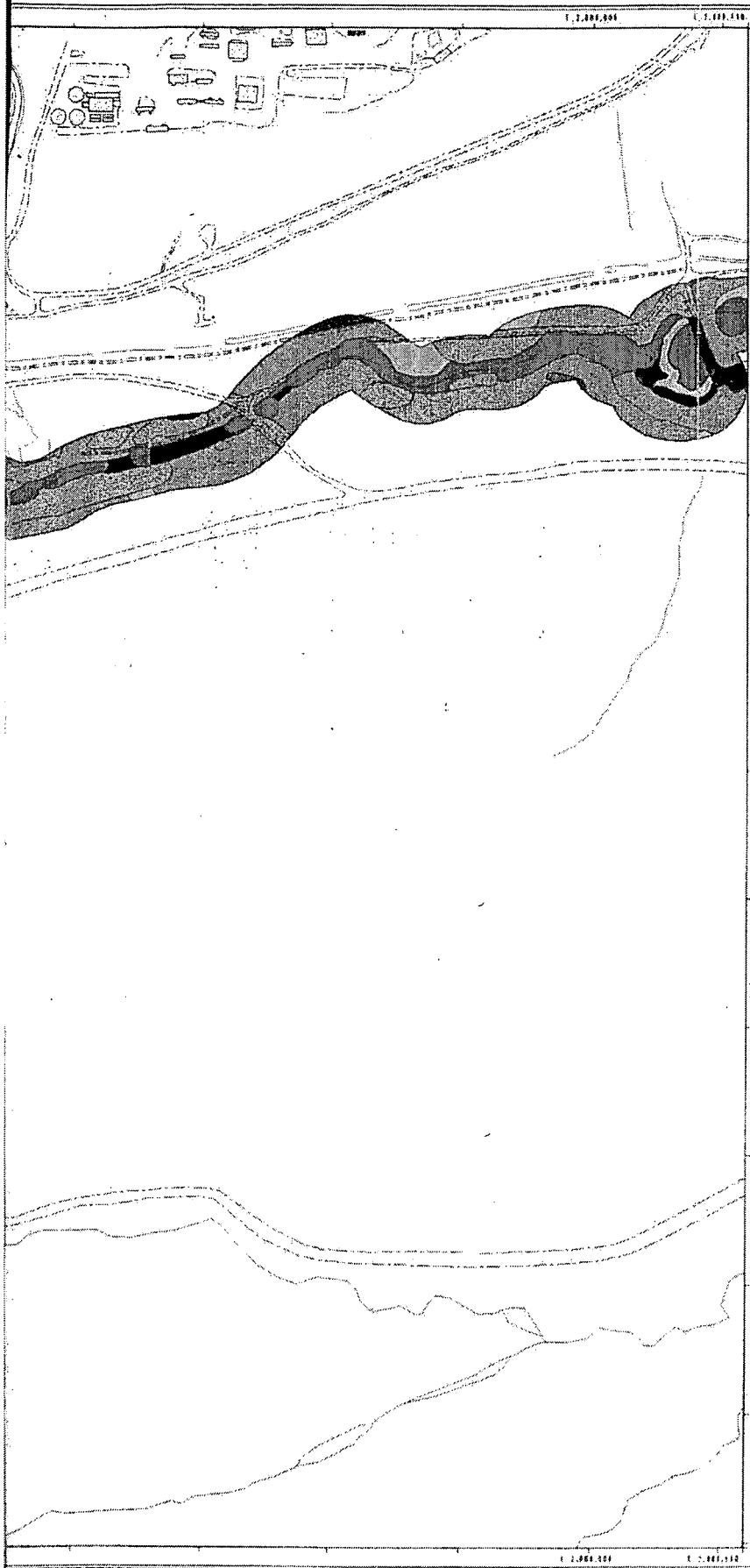
Figure 2



The relationship between number of Preble's meadow jumping mouse captures and the distance in meters from a stream is best described by a reciprocal-X fitted curve, as described via the following equation:
$$\text{Captures} = -11.6855 + \frac{408.427}{\text{Distance}}$$

Figure 3. Relationship between the number of Preble's meadow jumping mouse captures and distance from a stream.





Detail of the Preble's meadow jumping mouse habitat corridor in Woman Creek, Rocky Flats Environmental Technology Site.

Figure 4.

MAP LEGEND

- Xeric Tallgrass Prairie
- Mesic Mixed Grassland
- Reclaimed Grassland
- Wet Meadow/Marsh Ecotone
- Short Marsh
- Tall Marsh
- Short Upland Shrubland
- Tall Upland Shrubland
- Savannah Shrubland
- Leadplant Riparian Shrubland
- Willow Riparian Shrubland
- Riparian Woodland
- Disturbed and Developed Areas
- Mudflats
- Riprap, Rock, and Gravel Piles
- Open Water

Standard Map Features

- Buildings and other structures
- Streams, ditches, or other drainage features
- Paved roads
- Dirt roads

NOTE:
Habitat corridor is 35m
perpendicular to both sides
of the stream channel.

Scale = 1 : 6090
1 inch represents approximately 508 feet



State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared
by:

Exponent™

MAP ID: mmf98-008

May 20, 1998

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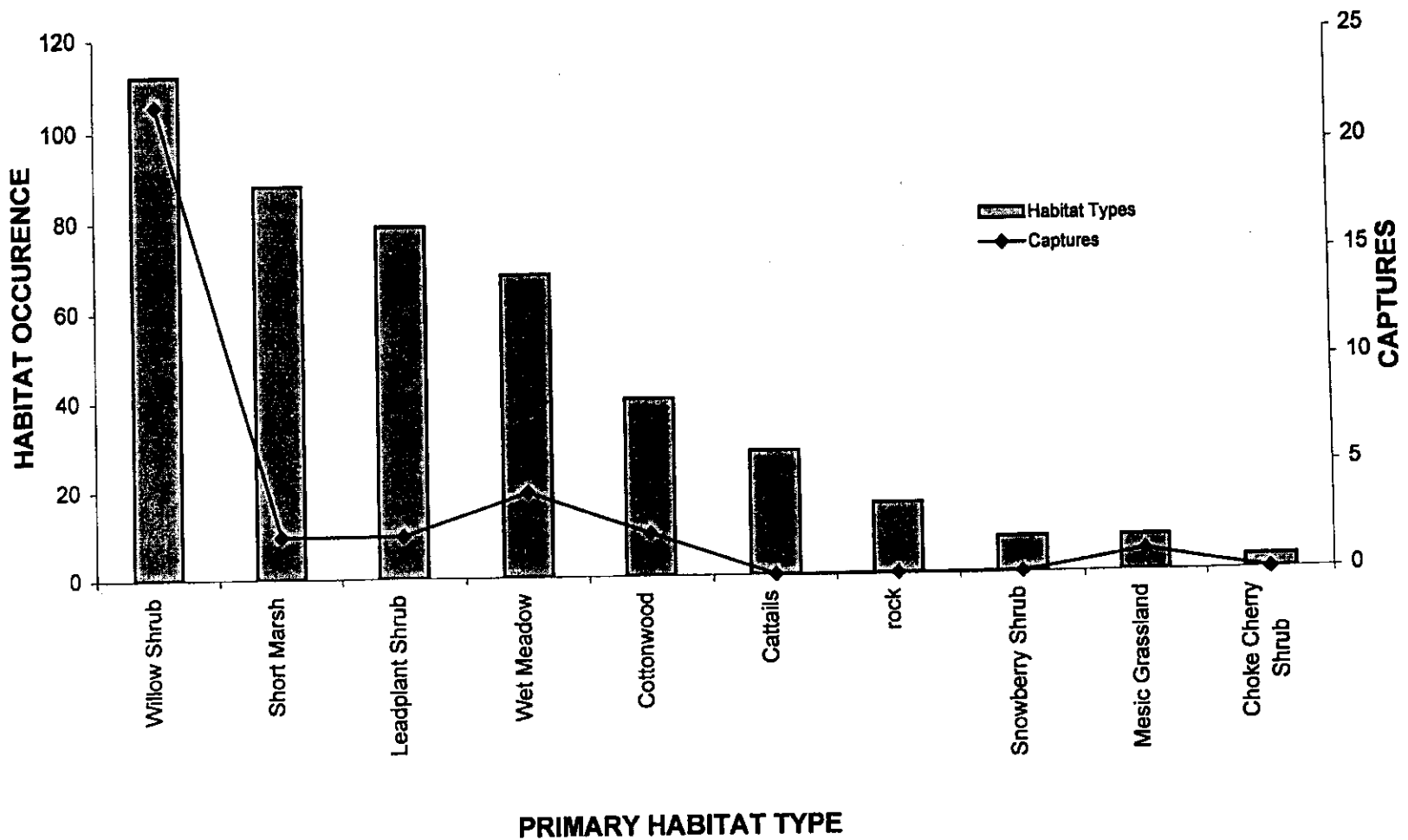


Figure 8. Preble's meadow jumping mouse captures in available riparian habitat of Woman Creek, 1997.

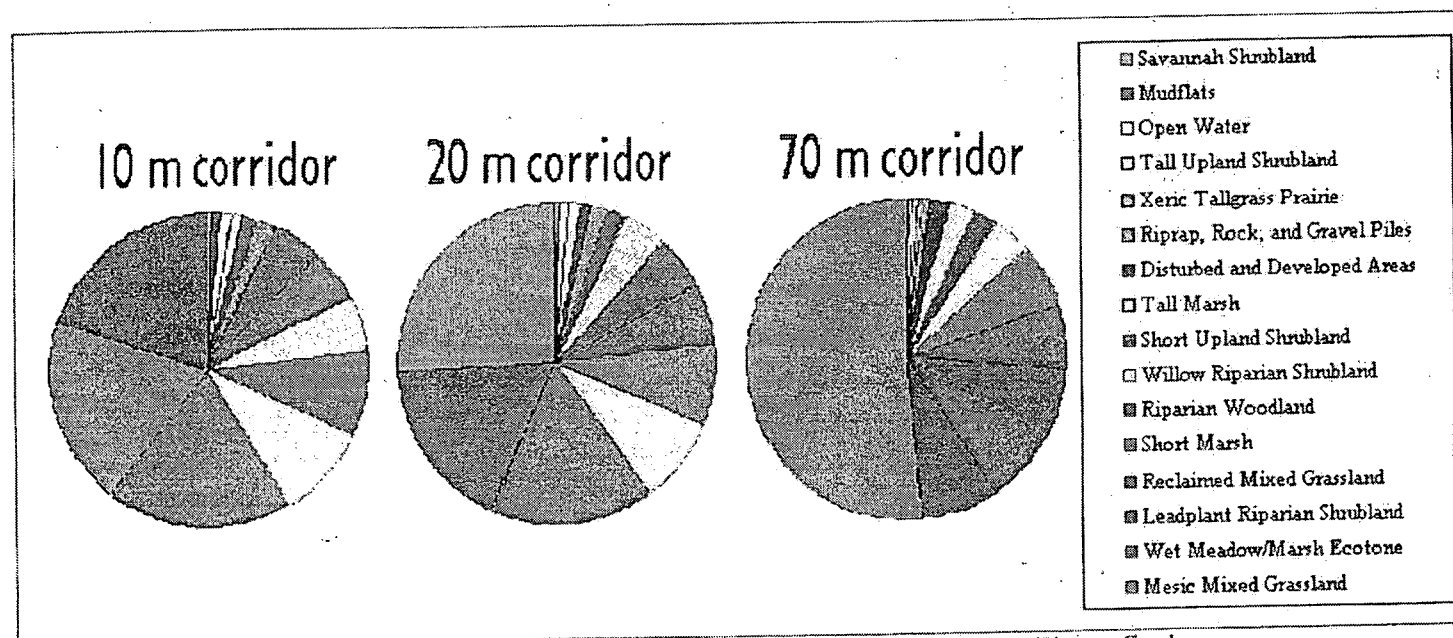
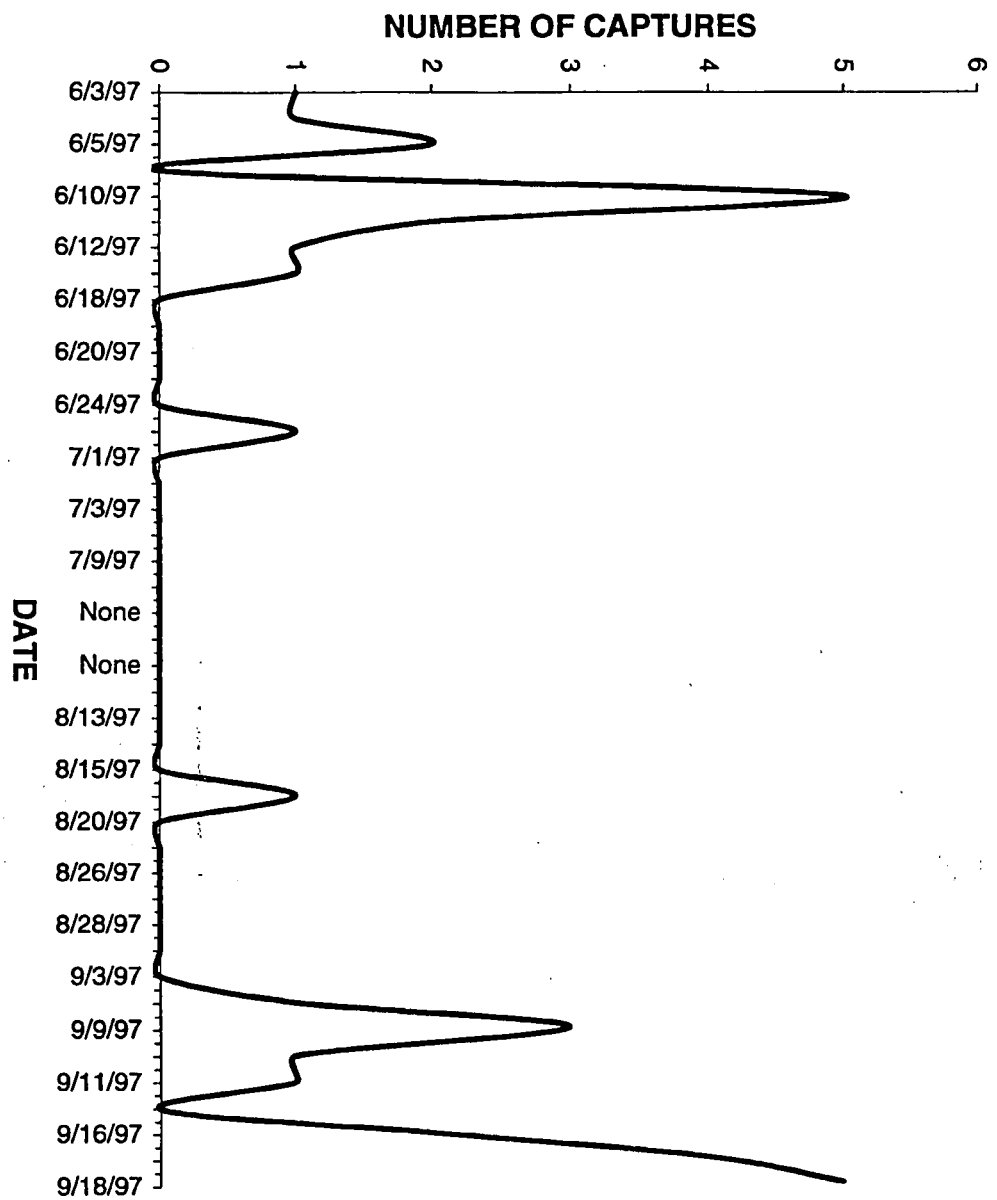


Figure 5. Comparison of relative vegetation community composition of three corridor widths along Woman Creek.

Figure 7. Preble's mouse captures per day in Woman Creek, 1997.



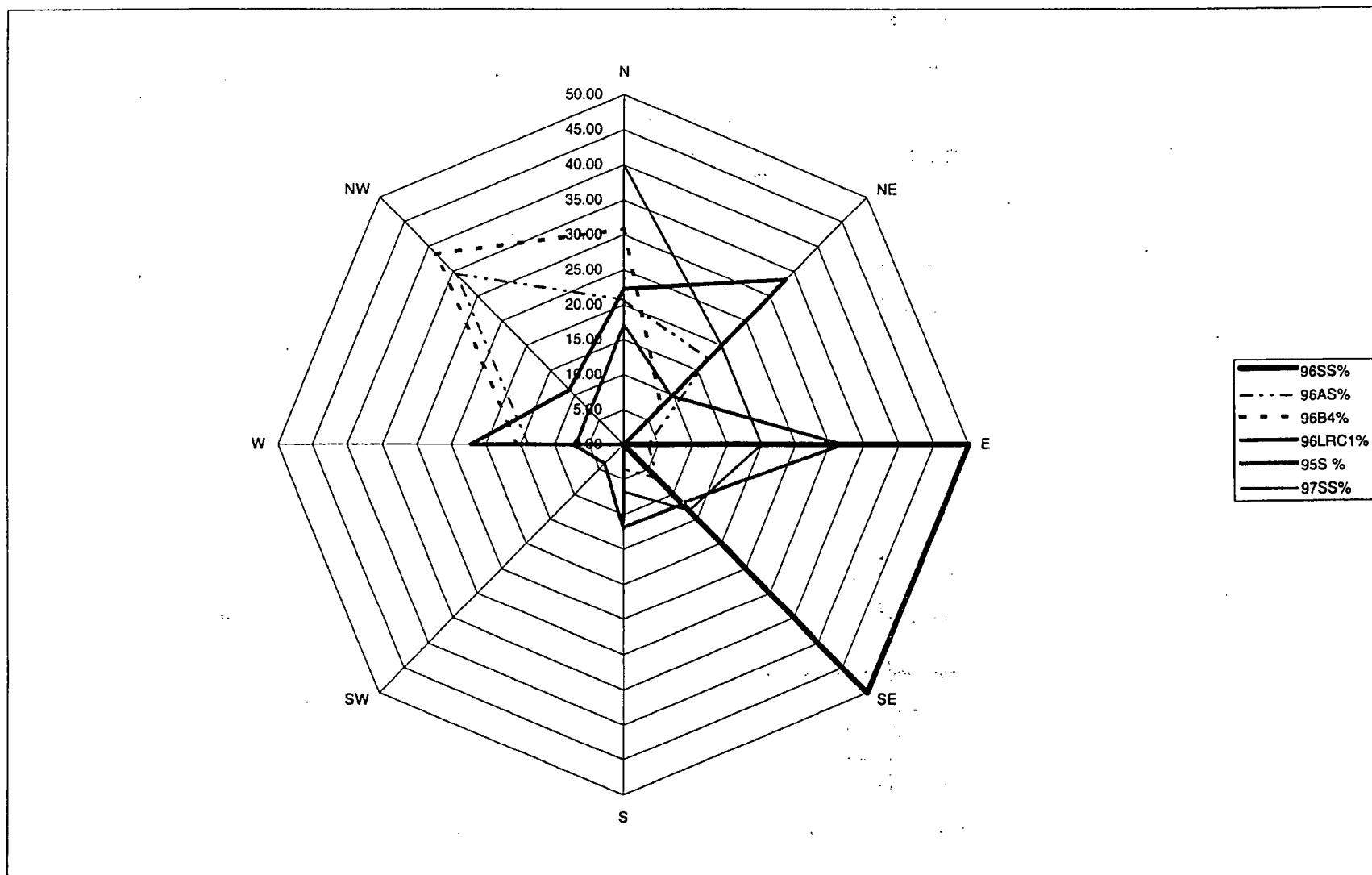


Figure 9. Summary of slope aspect measurements associated with Preble's mouse records, summer 1996 compared to spring 1996 and fall 1995

Note: 96SS% = 1996 All Summer Sites; 96AS% = 1996 All Spring Sites; 96B4% = 1996 Spring B-4 Dam Sites; 96LRC1% = 1996 Spring Lower Rock Creek Sites; 95S% = 1995 All Capture Sites, 97SS% = 1997 Woman Creek Sites.

Tables

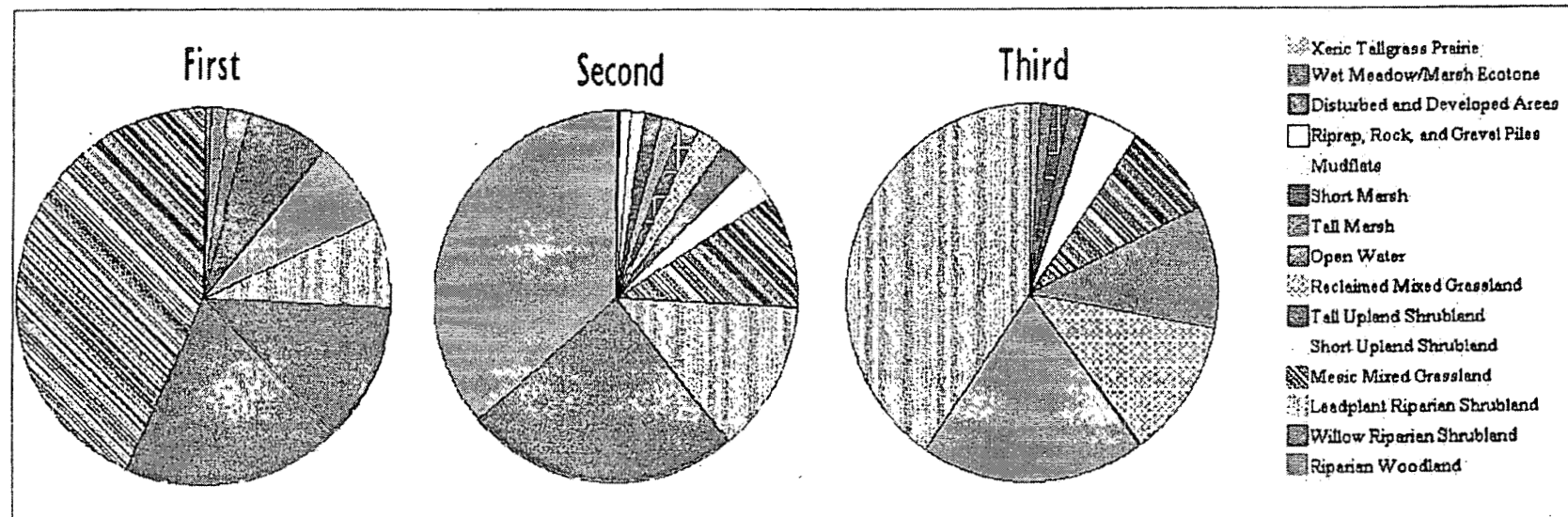


Figure 6. Vegetation community composition of the 10 m corridor surrounding the main channel of Woman Creek, divided roughly into thirds.

TABLE 1. OCCURRENCE OF PREBLE'S MOUSE WITH RESPECT TO STREAM DISTANCE

Range (m)	1995 Capture Sites		1996 All Sites		1996 B-4 Dam		1996 Lower Rock Creek		Total of All Captures	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
0-5	59	58.42	14	48.28	4	30.77	7	77.78	73	56.15
6-10	19	18.81	3	10.34	2	15.38	1	11.11	22	16.92
11-15	10	9.90	4	13.79	3	23.08	1	11.11	14	10.77
16-20	5	4.95	6	20.69	2	15.38	0	0.00	11	8.46
21-25	2	1.98	2	6.90	2	15.38	0	0.00	4	3.08
26-30	5	4.95	0	0.00	0	0.00	0	0.00	5	3.85
31-35	1	0.99	0	0.00	0	0.00	0	0.00	1	0.77
Total	101		29		13		9		130	

**TABLE 2. VEGETATION COMMUNITY COMPOSITION OF WOMAN CREEK,
BASED ON 3 DISTANCES FROM THE STREAM**

Description	Area (acres)			Percent Composition		
	10 m	20 m	70 m	10 m	20 m	70 m
Mesic Mixed Grassland	4.25	10.91	71.63	19	26	51
Leadplant Riparian Shrubland	4.40	7.50	10.75	20	18	8
Wet Meadow/Marsh Ecotone	1.23	2.61	10.42	6	6	7
Reclaimed Mixed Grassland	1.09	2.39	9.82	5	6	7
Riparian Woodland	4.11	6.87	9.14	19	16	7
Short Marsh	1.97	3.51	8.71	9	8	6
Willow Riparian Shrubland	2.08	3.63	5.78	9	9	4
Short Upland Shrubland	0.32	0.84	3.65	1	2	3
Tall Marsh	1.27	1.90	3.43	6	4	2
Disturbed and Developed Areas	0.20	0.52	2.72	1	1	2
Riprap, Rock, and Gravel Piles	0.39	0.64	1.08	2	2	1
Xeric Tallgrass Prairie	0.00	0.06	0.95	0.01	0.1	1
Tall Upland Shrubland	0.27	0.47	0.69	1	1	0.5
Open Water	0.23	0.32	0.50	1	1	0.4
Mudflats	0.09	0.18	0.26	0.4	0.4	0.2
Savannah Shrubland	0	0	0.004	0	0	0.003
Totals	21.91	42.34	139.52	100	100	100

TABLE 3. CAPTURE SUMMARY, PREBLE'S MOUSE TRAPPING IN WALNUT AND WOMAN CREEKS, 1997

Species	Common Name	Walnut Creek		Woman Creek		Total	
		Number	Percent	Number	Percent	Number	Percent
<i>Peromyscus maniculatus</i>	Deer Mouse	356	62.3%	912	65.4%	1268	64.5%
<i>Microtus pennsylvanicus</i>	Meadow Vole	178	31.2%	276	19.8%	454	23.1%
<i>Microtus longicaudus</i>	Longtailed Vole	0	0.0%	6	0.4%	6	0.3%
<i>Reithrodontomys megalotis</i>	Western Harvest Mouse	20	3.5%	75	5.4%	95	4.8%
<i>Microtus ochrogaster</i>	Prairie Vole	14	2.5%	7	0.5%	21	1.1%
<i>Zapus hudsonius</i>	Preble's Meadow Jumping Mouse	3	0.5%	33	2.4%	36	1.8%
<i>Neotoma mexicana</i>	Mexican Woodrat	0	0.0%	44	3.2%	44	2.2%
<i>Chaetodipus hispidus</i>	Hispid Pocket Mouse	0	0.0%	33	2.4%	33	1.7%
<i>Microtus</i> sp.	unknown Vole	0	0.0%	2	0.1%	2	0.1%
<i>Mus musculus</i>	House Mouse	0	0.0%	4	0.3%	4	0.2%
<i>Eutamias</i> sp.	unknown Chipmunk	0	0.0%	1	0.1%	1	0.1%
not determined	unknown rodent	0	0.0%	2	0.1%	2	0.1%
Total		571	100.0%	1395	100.0%	1966	100.0%

Note:

The first session for Walnut Creek trapping was from 7 May to 5 June (15 nights x 120 traps = 1,800 trap nights).

The second session for Walnut Creek trapping was from 7 October to 10 October (4 nights x 50 traps = 200 trap nights).

The first session for Woman Creek trapping was from 3 June to 10 July ((10 nights x 250 traps) + (10 nights x 200 traps) = 4,500 trap nights).

The second session for Woman Creek trapping was from 12 August to 29 August ((10 nights x 250) + (10 nights x 200 traps) = 4,500 trap nights).

The total trapping effort (session 1 and 2) for Walnut Creek was 2,000 trap nights.

The total trapping effort (session 1 and 2) for Woman Creek was 9,000 trap nights.

TABLE 4. SESSION SUMMARY, PREBLE'S MOUSE TRAPPING IN WALNUT AND WOMAN CREEKS, 1997

Species	Common Name	Walnut Creek		Woman Creek		Total	
		Number	Percent	Number	Percent	Number	Percent
First Session							
<i>Peromyscus maniculatus</i>	Deer Mouse	304	60.2%	575	75.4%	879	69.3%
<i>Microtus pennsylvanicus</i>	Meadow Vole	167	33.1%	128	16.8%	295	23.3%
<i>Microtus longicaudus</i>	Longtailed Vole	0	0.0%	0	0.0%	0	0.0%
<i>Reithrodontomys megalotis</i>	Western Harvest Mouse	20	4.0%	21	2.8%	41	3.2%
<i>Microtus ochrogaster</i>	Prairie Vole	11	2.2%	2	0.3%	13	1.0%
<i>Zapus hudsonius</i>	Preble's Meadow Jumping Mouse	3	0.6%	14	1.8%	17	1.3%
<i>Neotoma mexicana</i>	Mexican Woodrat	0	0.0%	15	2.0%	15	1.2%
<i>Chaetodipus hispidus</i>	Hispid Pocket Mouse	0	0.0%	3	0.4%	3	0.2%
<i>Microtus</i> sp.	unknown Vole	0	0.0%	2	0.3%	2	0.2%
<i>Mus musculus</i>	House Mouse	0	0.0%	2	0.3%	2	0.2%
<i>Eutamias</i> sp.	unknown Chipmunk	0	0.0%	0	0.0%	0	0.0%
not determined	unknown rodent	0	0.0%	1	0.1%	1	0.1%
Total		505	100.0%	763	100.0%	1268	100.0%
Second Session							
<i>Peromyscus maniculatus</i>	Deer Mouse	52	78.8%	337	53.3%	389	55.7%
<i>Microtus pennsylvanicus</i>	Meadow Vole	11	16.7%	148	23.4%	159	22.8%
<i>Microtus longicaudus</i>	Longtailed Vole	0	0.0%	6	0.9%	6	0.9%
<i>Reithrodontomys megalotis</i>	Western Harvest Mouse	0	0.0%	54	8.5%	54	7.7%
<i>Microtus ochrogaster</i>	Prairie Vole	3	4.5%	5	0.8%	8	1.1%
<i>Zapus hudsonius</i>	Preble's Meadow Jumping Mouse	0	0.0%	19	3.0%	19	2.7%
<i>Neotoma mexicana</i>	Mexican Woodrat	0	0.0%	29	4.6%	29	4.2%
<i>Chaetodipus hispidus</i>	Hispid Pocket Mouse	0	0.0%	30	4.7%	30	4.3%
<i>Microtus</i> sp.	unknown Vole	0	0.0%	0	0.0%	0	0.0%
<i>Mus musculus</i>	House Mouse	0	0.0%	2	0.3%	2	0.3%
<i>Eutamias</i> sp.	unknown Chipmunk	0	0.0%	1	0.2%	1	0.1%
not determined	unknown rodent	0	0.0%	1	0.2%	1	0.1%
Total		66	100.0%	632	100.0%	698	100.0%

**TABLE 5. SMALL MAMMAL SPECIES RICHNESS PER SITE, STREAM CLASS
AND VEGETATION TYPE, PREBLE'S MOUSE PRESENCE IN WOMAN CREEK, 1997**

Site Name	Stream Segment Classification and Vegetation Type	Species Richness	Preble's Mice
Z97-64	Gaining Reach/Non-Woody	5	No
Z97-65	Spring Gaining Reach/Woody	2	No
Z97-66	Unclassified Reach/Non-Woody	4	No
Z97-67	Two-Month Gaining Reach/Woody	6	Yes
Z97-68	Losing Reach/Woody	5	Yes
Z97-69	Losing Reach/Non-Woody	5	No
Z97-70	Unclassified Reach/Woody	6	No
Z97-71	Two-Month Gaining Reach/Non-Woody	7	Yes
Z97-72	Gaining Reach/Woody	7	Yes
N/A	Spring Gaining Reach/Non-Woody	-	-

TABLE 6. TRAPPING RESULTS FOR WOMAN CREEK SITE Z97-64*, FIRST AND SECOND SESSIONS AND TOTALS, 1997

Species	Common Name	First Session		Second Session		Total	
		Number	Percent	Number	Percent	Number	Percent
<i>Peromyscus maniculatus</i>	Deer Mouse	52	59.8%	14	31.8%	66	50.4%
<i>Microtus pennsylvanicus</i>	Meadow Vole	32	36.8%	23	52.3%	55	42.0%
<i>Microtus longicaudus</i>	Longtailed Vole	0	0.0%	0	0.0%	0	0.0%
<i>Reithrodontomys megalotis</i>	Western Harvest Mouse	2	2.3%	3	6.8%	5	3.8%
<i>Microtus ochrogaster</i>	Prairie Vole	0	0.0%	2	4.5%	2	1.5%
<i>Zapus hudsonius</i>	Preble's Meadow Jumping Mouse	0	0.0%	0	0.0%	0	0.0%
<i>Neotoma mexicana</i>	Mexican Woodrat	0	0.0%	0	0.0%	0	0.0%
<i>Chaetodipus hispidus</i>	Hispid Pocket Mouse	0	0.0%	0	0.0%	0	0.0%
<i>Microtus</i> sp.	unknown Vole	1	1.1%	0	0.0%	1	0.8%
<i>Mus musculus</i>	House Mouse	0	0.0%	2	4.5%	2	1.5%
<i>Eutamias</i> sp.	unknown Chipmunk	0	0.0%	0	0.0%	0	0.0%
not determined	unknown rodent	0	0.0%	0	0.0%	0	0.0%
Total		87	100.0%	44	100.0%	131	100.0%

* Site Z97- 64 is in a non-woody/gaining reach of Woman Creek.

TABLE 7. TRAPPING RESULTS FOR WOMAN CREEK SITE Z97-65^a, FIRST AND SECOND SESSIONS AND TOTALS, 1997

Species	Common Name	First Session		Second Session		Total	
		Number	Percent	Number	Percent	Number	Percent
<i>Peromyscus maniculatus</i>	Deer Mouse	98	92.5%	30	76.9%	128	88.3%
<i>Microtus pennsylvanicus</i>	Meadow Vole	6	5.7%	9	23.1%	15	10.3%
<i>Microtus longicaudus</i>	Longtailed Vole	0	0.0%	0	0.0%	0	0.0%
<i>Reithrodontomys megalotis</i>	Western Harvest Mouse	0	0.0%	0	0.0%	0	0.0%
<i>Microtus ochrogaster</i>	Prairie Vole	0	0.0%	0	0.0%	0	0.0%
<i>Zapus hudsonius</i>	Preble's Meadow Jumping Mouse	0	0.0%	0	0.0%	0	0.0%
<i>Neotoma mexicana</i>	Mexican Woodrat	0	0.0%	0	0.0%	0	0.0%
<i>Chaetodipus hispidus</i>	Hispid Pocket Mouse	0	0.0%	0	0.0%	0	0.0%
<i>Microtus</i> sp.	unknown Vole	1	0.9%	0	0.0%	1	0.7%
<i>Mus musculus</i>	House Mouse	0	0.0%	0	0.0%	0	0.0%
<i>Eutamias</i> sp.	unknown Chipmunk	0	0.0%	0	0.0%	0	0.0%
not determined	unknown rodent	1	0.9%	0	0.0%	1	0.7%
Total		106	100.0%	39	100.0%	145	100.0%

^a Site Z97- 65 is in a woody/spring gaining reach of Woman Creek.

TABLE 8. TRAPPING RESULTS FOR WOMAN CREEK SITE Z97-66*, FIRST AND SECOND SESSIONS AND TOTALS, 1997

Species	Common Name	First Session		Second Session		Total	
		Number	Percent	Number	Percent	Number	Percent
<i>Peromyscus maniculatus</i>	Deer Mouse	7	26.9%	6	8.5%	13	13.4%
<i>Microtus pennsylvanicus</i>	Meadow Vole	7	26.9%	33	46.5%	40	41.2%
<i>Microtus longicaudus</i>	Longtailed Vole	0	0.0%	0	0.0%	0	0.0%
<i>Reithrodontomys megalotis</i>	Western Harvest Mouse	10	38.5%	32	45.1%	42	43.3%
<i>Microtus ochrogaster</i>	Prairie Vole	0	0.0%	0	0.0%	0	0.0%
<i>Zapus hudsonius</i>	Preble's Meadow Jumping Mouse	0	0.0%	0	0.0%	0	0.0%
<i>Neotoma mexicana</i>	Mexican Woodrat	2	7.7%	0	0.0%	2	2.1%
<i>Chaetodipus hispidus</i>	Hispid Pocket Mouse	0	0.0%	0	0.0%	0	0.0%
<i>Microtus</i> sp.	unknown Vole	0	0.0%	0	0.0%	0	0.0%
<i>Mus musculus</i>	House Mouse	0	0.0%	0	0.0%	0	0.0%
<i>Eutamias</i> sp.	unknown Chipmunk	0	0.0%	0	0.0%	0	0.0%
not determined	unknown rodent	0	0.0%	0	0.0%	0	0.0%
Total		26	100.0%	71	100.0%	97	100.0%

* Site Z97- 66 is in a non-woody/unclassified reach of Woman Creek.

TABLE 9. TRAPPING RESULTS FOR WOMAN CREEK SITE Z97-67^a, FIRST AND SECOND SESSIONS AND TOTALS, 1997

Species	Common Name	First Session		Second Session		Total	
		Number	Percent	Number	Percent	Number	Percent
<i>Peromyscus maniculatus</i>	Deer Mouse	36	49.3%	19	47.5%	55	48.7%
<i>Microtus pennsylvanicus</i>	Meadow Vole	16	21.9%	10	25.0%	26	23.0%
<i>Microtus longicaudus</i>	Longtailed Vole	0	0.0%	0	0.0%	0	0.0%
<i>Reithrodontomys megalotis</i>	Western Harvest Mouse	5	6.8%	9	22.5%	14	12.4%
<i>Microtus ochrogaster</i>	Prairie Vole	2	2.7%	0	0.0%	2	1.8%
<i>Zapus hudsonius</i>	Preble's Meadow Jumping Mouse	8	11.0%	1	2.5%	9	8.0%
<i>Neotoma mexicana</i>	Mexican Woodrat	6	8.2%	1	2.5%	7	6.2%
<i>Chaetodipus hispidus</i>	Hispid Pocket Mouse	0	0.0%	0	0.0%	0	0.0%
<i>Microtus</i> sp.	unknown Vole	0	0.0%	0	0.0%	0	0.0%
<i>Mus musculus</i>	House Mouse	0	0.0%	0	0.0%	0	0.0%
<i>Eutamias</i> sp.	unknown Chipmunk	0	0.0%	0	0.0%	0	0.0%
not determined	unknown rodent	0	0.0%	0	0.0%	0	0.0%
Total		73	100.0%	40	100.0%	113	100.0%

^a Site Z97- 67 is in a woody/two-month gaining reach of Woman Creek.

TABLE 10. TRAPPING RESULTS FOR WOMAN CREEK SITE Z97-68^a, FIRST AND SECOND SESSIONS AND TOTALS, 1997

Species	Common Name	First Session		Second Session		Total	
		Number	Percent	Number	Percent	Number	Percent
<i>Peromyscus maniculatus</i>	Deer Mouse	50	80.6%	25	39.7%	75	60.0%
<i>Microtus pennsylvanicus</i>	Meadow Vole	5	8.1%	27	42.9%	32	25.6%
<i>Microtus longicaudus</i>	Longtailed Vole	0	0.0%	0	0.0%	0	0.0%
<i>Reithrodontomys megalotis</i>	Western Harvest Mouse	0	0.0%	0	0.0%	0	0.0%
<i>Microtus ochrogaster</i>	Prairie Vole	0	0.0%	0	0.0%	0	0.0%
<i>Zapus hudsonius</i>	Preble's Meadow Jumping Mouse	5	8.1%	0	0.0%	5	4.0%
<i>Neotoma mexicana</i>	Mexican Woodrat	0	0.0%	2	3.2%	2	1.6%
<i>Chaetodipus hispidus</i>	Hispid Pocket Mouse	2	3.2%	9	14.3%	11	8.8%
<i>Microtus</i> sp.	unknown Vole	0	0.0%	0	0.0%	0	0.0%
<i>Mus musculus</i>	House Mouse	0	0.0%	0	0.0%	0	0.0%
<i>Eutamias</i> sp.	unknown Chipmunk	0	0.0%	0	0.0%	0	0.0%
not determined	unknown rodent	0	0.0%	0	0.0%	0	0.0%
Total		62	100.0%	63	100.0%	125	100.0%

^a Site Z97- 68 is in a woody/losing reach of Woman Creek.

TABLE 11. TRAPPING RESULTS FOR WOMAN CREEK SITE Z97-69*, FIRST AND SECOND SESSIONS AND TOTALS, 1997

Species	Common Name	First Session		Second Session		Total	
		Number	Percent	Number	Percent	Number	Percent
<i>Peromyscus maniculatus</i>	Deer Mouse	147	87.0%	95	77.9%	242	83.2%
<i>Microtus pennsylvanicus</i>	Meadow Vole	21	12.4%	18	14.8%	39	13.4%
<i>Microtus longicaudus</i>	Longtailed Vole	0	0.0%	0	0.0%	0	0.0%
<i>Reithrodontomys megalotis</i>	Western Harvest Mouse	0	0.0%	1	0.8%	1	0.3%
<i>Microtus ochrogaster</i>	Prairie Vole	0	0.0%	0	0.0%	0	0.0%
<i>Zapus hudsonius</i>	Preble's Meadow Jumping Mouse	0	0.0%	0	0.0%	0	0.0%
<i>Neotoma mexicana</i>	Mexican Woodrat	1	0.6%	6	4.9%	7	2.4%
<i>Chaetodipus hispidus</i>	Hispid Pocket Mouse	0	0.0%	2	1.6%	2	0.7%
<i>Microtus</i> sp.	unknown Vole	0	0.0%	0	0.0%	0	0.0%
<i>Mus musculus</i>	House Mouse	0	0.0%	0	0.0%	0	0.0%
<i>Eutamias</i> sp.	unknown Chipmunk	0	0.0%	0	0.0%	0	0.0%
not determined	unknown rodent	0	0.0%	0	0.0%	0	0.0%
Total		169	100.0%	122	100.0%	291	100.0%

* Site Z97- 69 is in a non-woody/losing reach of Woman Creek.

TABLE 12. TRAPPING RESULTS FOR WOMAN CREEK SITE Z97-70*, FIRST AND SECOND SESSIONS AND TOTALS, 1997

Species	Common Name	First Session		Second Session		Total	
		Number	Percent	Number	Percent	Number	Percent
<i>Peromyscus maniculatus</i>	Deer Mouse	65	92.9%	80	72.1%	145	80.1%
<i>Microtus pennsylvanicus</i>	Meadow Vole	3	4.3%	2	1.8%	5	2.8%
<i>Microtus longicaudus</i>	Longtailed Vole	0	0.0%	0	0.0%	0	0.0%
<i>Reithrodontomys megalotis</i>	Western Harvest Mouse	0	0.0%	1	0.9%	1	0.6%
<i>Microtus ochrogaster</i>	Prairie Vole	0	0.0%	3	2.7%	3	1.7%
<i>Zapus hudsonius</i>	Preble's Meadow Jumping Mouse	0	0.0%	0	0.0%	0	0.0%
<i>Neotoma mexicana</i>	Mexican Woodrat	1	1.4%	5	4.5%	6	3.3%
<i>Chaetodipus hispidus</i>	Hispid Pocket Mouse	1	1.4%	19	17.1%	20	11.0%
<i>Microtus</i> sp.	unknown Vole	0	0.0%	0	0.0%	0	0.0%
<i>Mus musculus</i>	House Mouse	0	0.0%	0	0.0%	0	0.0%
<i>Eutamias</i> sp.	unknown Chipmunk	0	0.0%	0	0.0%	0	0.0%
not determined	unknown rodent	0	0.0%	1	0.9%	1	0.6%
Total		70	100.0%	111	100.0%	181	100.0%

* Site Z97- 70 is in a woody/unclassified reach of Woman Creek.

TABLE 13. TRAPPING RESULTS FOR WOMAN CREEK SITE Z97-71*, FIRST AND SECOND SESSIONS AND TOTALS, 1997

Species	Common Name	First Session		Second Session		Total	
		Number	Percent	Number	Percent	Number	Percent
<i>Peromyscus maniculatus</i>	Deer Mouse	72	72.0%	28	46.7%	100	62.5%
<i>Microtus pennsylvanicus</i>	Meadow Vole	24	24.0%	13	21.7%	37	23.1%
<i>Microtus longicaudus</i>	Longtailed Vole	0	0.0%	6	10.0%	6	3.8%
<i>Reithrodontomys megalotis</i>	Western Harvest Mouse	3	3.0%	2	3.3%	5	3.1%
<i>Microtus ochrogaster</i>	Prairie Vole	0	0.0%	0	0.0%	0	0.0%
<i>Zapus hudsonius</i>	Preble's Meadow Jumping Mouse	0	0.0%	6	10.0%	6	3.8%
<i>Neotoma mexicana</i>	Mexican Woodrat	0	0.0%	5	8.3%	5	3.1%
<i>Chaetodipus hispidus</i>	Hispid Pocket Mouse	0	0.0%	0	0.0%	0	0.0%
<i>Microtus</i> sp.	unknown Vole	0	0.0%	0	0.0%	0	0.0%
<i>Mus musculus</i>	House Mouse	1	1.0%	0	0.0%	1	0.6%
<i>Eutamias</i> sp.	unknown Chipmunk	0	0.0%	0	0.0%	0	0.0%
not determined	unknown rodent	0	0.0%	0	0.0%	0	0.0%
Total		100	100.0%	60	100.0%	160	100.0%

* Site Z97-71 is in a non-woody/two-month gaining reach of Woman Creek.

TABLE 14. TRAPPING RESULTS FOR WOMAN CREEK SITE Z97-72*, FIRST AND SECOND SESSIONS AND TOTALS, 1997

Species	Common Name	First Session		Second Session		Total	
		Number	Percent	Number	Percent	Number	Percent
<i>Peromyscus maniculatus</i>	Deer Mouse	48	68.6%	40	48.8%	88	57.9%
<i>Microtus pennsylvanicus</i>	Meadow Vole	14	20.0%	13	15.9%	27	17.8%
<i>Microtus longicaudus</i>	Longtailed Vole	0	0.0%	0	0.0%	0	0.0%
<i>Reithrodontomys megalotis</i>	Western Harvest Mouse	1	1.4%	6	7.3%	7	4.6%
<i>Microtus ochrogaster</i>	Prairie Vole	0	0.0%	0	0.0%	0	0.0%
<i>Zapus hudsonius</i>	Preble's Meadow Jumping Mouse	1	1.4%	12	14.6%	13	8.6%
<i>Neotoma mexicana</i>	Mexican Woodrat	5	7.1%	10	12.2%	15	9.9%
<i>Chaetodipus hispidus</i>	Hispid Pocket Mouse	0	0.0%	0	0.0%	0	0.0%
<i>Microtus</i> sp.	unknown Vole	0	0.0%	0	0.0%	0	0.0%
<i>Mus musculus</i>	House Mouse	1	1.4%	0	0.0%	1	0.7%
<i>Eutamias</i> sp.	unknown Chipmunk	0	0.0%	1	1.2%	1	0.7%
not determined	unknown rodent	0	0.0%	0	0.0%	0	0.0%
Total		70	100.0%	82	100.0%	152	100.0%

* Site Z97- 72 is in a woody/gaining reach of Woman Creek.

**TABLE 15. 1997 TRANSECT CLASSIFICATIONS BASED ON
TRAPPING AND HABITAT CHARACTERIZATION**

Sample Site	Successful vs. Non-successful	Woody vs. Herbaceous	Original Hydrotype	Reclassified Hydrotype	Number of PMJM Captures
Z97-64	NS	H	G	HG	0
Z97-66	NS	H	UKN	HG	0
Z97-69	NS	H	L	HL	0
Z97-65	NS	W	SG	WG	0
Z97-70	NS	W	UKN	WL	0
Z97-71	S	H	TMG	HL	6
Z97-67	S	W	TMG	WL	9
Z97-68	S	W	L	WL	5
Z97-72	S	W	G	WG	13
Total Captures					33

Notes:

S = Successful
 NS = Non-successful
 H = Herbaceous
 W = Woody
 G = Gaining
 UKN = Unknown
 L = Losing

SG = Spring Gaining
 TMG = Two-Month Gaining
 HG = Herbaceous Gaining
 HL = Herbaceous Losing
 WG = Woody Gaining
 WL = Woody Losing

TABLE 16. 1997 PMJM HABITAT CHARACTERIZATION PARAMETERS

Parameters	Site Success				Woody Density							
	Successful		Non-Successful		Woody		Herbaceous		Gaining		Losing	
	O	F	O	F	O	F	O	F	O	F	O	F
# Species/Trapsite	26.58	7.80	25.82	7.59	24.62 ^b	8.08	28.08 ^b	6.70	24.00	9.34	27.20	4.82
Herbaceous Density	71.89 ^a	21.66	50.77 ^a	25.81	76.57 ^a	19.78	39.64 ^a	17.67	56.70	28.25	64.13	29.69
Tree/Shrub Canopy	24.19 ^a	30.66	10.10 ^a	22.44	28.63 ^a	31.43	1.03 ^a	3.36	12.38	22.73	8.67	17.34
Woody Cover Index	66.56 ^a	35.14	30.70 ^a	35.16	72.02 ^a	32.69	14.91 ^a	17.91	—	—	—	—
Herbaceous Cover Inde	66.81	37.28	65.06	39.41	51.57 ^a	34.11	83.68 ^a	35.97	—	—	—	—
Basal Vegetation Cover	20.90	15.65	13.51	9.03	15.72	12.31	18.14	13.60	12.30	8.39	17.40	13.08
Litter Cover	31.58 ^a	28.83	17.58 ^a	21.69	28.00	29.36	18.55	19.99	30.78	24.03	22.30	30.49
Rock Cover	10.06	19.42	12.60	19.93	12.55	18.87	10.13	20.71	9.93	20.55	20.13	28.94
Soil Cover	8.00	13.24	7.48	16.33	10.02	16.99	4.83	11.51	9.33	13.40	9.70	16.78
Water Cover	8.35	8.09	4.92	7.53	8.10	8.05	4.38	7.35	3.20	4.22	6.10	6.80

TABLE 16. (cont.)

Parameters	Hydrotype					
	Spring Gain		Two-Month Gain		Unknown	
	O	F	O	F	O	F
# Species/Trapsite	29.00	10.83	28.15	7.69	23.85	5.40
Herbaceous Density	66.95	15.64	63.08	24.26	53.34	26.60
Tree/Shrub Canopy	34.55	31.58	29.30	35.02	6.01	20.07
Woody Cover Index	--	--	--	--	--	--
Herbaceous Cover Index	--	--	--	--	--	--
Basal Vegetation Cover	15.75	12.80	25.00	16.91	13.00	7.97
Litter Cover	25.30	27.86	24.43	24.31	16.95	24.03
Rock Cover	17.90	14.65	6.85	14.33	5.78	8.91
Soil Cover	18.30	26.72	5.40	11.45	1.18	0.98
Water Cover	14.65	9.69	10.83	9.11	1.55	3.33

* Significant difference ($P < 0.05$) Mann-Whitney U test.

^b Significant difference ($P < 0.05$) t-test.

No significant differences between Hydrotype values using a Kruskal-Wallis test.

No significant differences for rock, soil, or water cover (under Site Success or Woody Density) using a Ma

No significant differences for # Species/Trapsite, Herbaceous Cover Index, or Basal Vegetation Cover using

TABLE 17. 1997 SPECIES RICHNESS AT SUCCESSFUL SITES

Family	Scientific Name	Spec Code	Native	Wetland Indicator
ACERACEAE	<i>Acer negundo</i> L. var. <i>interius</i> (Britt.) Sarg.	ACNE1	Y	FAC
AGAVACEAE	<i>Yucca glauca</i> Nutt.	YUGL1	Y	
ANACARDIACEAE	<i>Rhus aromatica</i> Ait. var. <i>trilobata</i> (Nutt.) A. Gray	RHAR1	Y	UPL
APIACEAE	<i>Conium maculatum</i> L.	COMA1	N	FACW
ASCLEPIADACEAE	<i>Asclepias incarnata</i> L.	ASIN1	Y	OBL
ASCLEPIADACEAE	<i>Asclepias speciosa</i> Torr.	ASSP1	Y	FAC
ASTERACEAE	<i>Achillea millefolium</i> L. ssp. <i>lanulosa</i> (Nutt.) Piper	ACMI1	Y	FACU
ASTERACEAE	<i>Ambrosia psilostachya</i> DC.	AMPS1	Y	FAC
ASTERACEAE	<i>Ambrosia trifida</i> L.	AMTR1	Y	FACW
ASTERACEAE	<i>Artemisia ludoviciana</i> Nutt. var. <i>ludoviciana</i>	ARLU1	Y	FACU-
ASTERACEAE	<i>Aster hesperius</i> A. Gray var. <i>hesperius</i>	ASHE1	Y	OBL
ASTERACEAE	<i>Carduus nutans</i> L. ssp. <i>macrolepis</i> (Petern.) Kazmi	CANU1	N	
ASTERACEAE	<i>Centaurea diffusa</i> Lam.	CEDI1	N	
ASTERACEAE	<i>Chrysopsis villosa</i> Pursh.	CHVI1	Y	
ASTERACEAE	<i>Cirsium arvense</i> (L.) Scop.	CIAR1	N	FACU
ASTERACEAE	<i>Erigeron divergens</i> T. & G.	ERDI1	Y	
ASTERACEAE	<i>Grindelia squarrosa</i> (Pursh.) Dun.	GRSQ1	Y	FACU-
ASTERACEAE	<i>Lactuca scariola</i> L.	LASE1	N	FAC
ASTERACEAE	<i>Solidago gigantea</i> Ait.	SOGI1	Y	FACW
ASTERACEAE	<i>Solidago missouriensis</i> Nutt.	SOMI1	Y	
ASTERACEAE	<i>Sonchus asper</i> (L.) Hill	SOAS1	N	FACW
ASTERACEAE	<i>Taraxacum officinale</i> Weber	TAOF1	N	FACU
ASTERACEAE	<i>Tragopogon dubius</i> Scop.	TRDU1	N	
BORAGINACEAE	<i>Cynoglossum officinale</i> L.	CYOF1	N	NI
BRASSICACEAE	<i>Alyssum alyssoides</i> (L.) L.	ALAL1	N	
BRASSICACEAE	<i>Alyssum minus</i> (L.) Rothmaler var. <i>micranthus</i> (C. A. Mey.) Dudley	ALMI1	N	
BRASSICACEAE	<i>Arabis glabra</i> (L.) Bernh.	ARGL1	N	
BRASSICACEAE	<i>Barbarea vulgaris</i> R. Br.	BAVU1	N	FAC
BRASSICACEAE	<i>Descurainia pinnata</i> (Walt.) Britt.	DEPI1	Y	
BRASSICACEAE	<i>Lepidium campestre</i> (L.) R. Br.	LECA1	N	
BRASSICACEAE	<i>Sisymbrium altissimum</i> L.	SIAL1	N	FACU
BRASSICACEAE	<i>Thlaspi arvense</i> L.	THAR1	N	FACU
CACTACEAE	<i>Opuntia macrorhiza</i> Engelm.	OPMA1	Y	
CAPRIFOLIACEAE	<i>Symphoricarpos occidentalis</i> Hook.	SYOC1	Y	NI
CARYOPHYLLACEAE	<i>Silene antirrhina</i> L.	SIAN1	Y	
CHENOPODIACEAE	<i>Chenopodium album</i> L.	CHAL1	N	FAC
CLUSIACEAE	<i>Hypericum perforatum</i> L.	HYPE1	N	
CUPRESSACEAE	<i>Juniperus scopulorum</i> Sarg.	JUSC1	T	
CYPERACEAE	<i>Carex brevior</i> (Dew.) Mack. ex Lunell.	CABR1	Y	FAC
CYPERACEAE	<i>Carex eleocharis</i> Bailey	CAEL1	Y	
CYPERACEAE	<i>Carex hystericina</i> Muhl. ex Willd.	CAHY1	Y	OBL
CYPERACEAE	<i>Carex lanuginosa</i> Michx.	CALA1	Y	OBL
CYPERACEAE	<i>Carex nebrascensis</i> Dew.	CANE1	Y	OBL
CYPERACEAE	<i>Carex praegracilis</i> W. Boott.	CAPR1	Y	FACW
CYPERACEAE	<i>Carex scoparia</i> Schkuhr. ex Willd.	CASC1	Y	FACW
CYPERACEAE	<i>Carex simulata</i> Mack.	CASI1	Y	NI
CYPERACEAE	<i>Eleocharis macrostachya</i> Britt.	ELMA1	Y	OBL
CYPERACEAE	<i>Scirpus pallidus</i> (Britt.) Fern	SCPA1	Y	OBL
CYPERACEAE	<i>Scirpus pungens</i> Vahl	SCAM1	Y	OBL
CYPERACEAE	<i>Scirpus validus</i> Vahl.	SCVA1	Y	OBL
EQUISETACEAE	<i>Equisetum arvense</i> L.	EQAR1	Y	FAC
EQUISETACEAE	<i>Equisetum laevigatum</i> A. Br.	EQLA1	Y	FACW
FABACEAE	<i>Amorpha fruticosa</i> L.	AMFR1	Y	OBL
FABACEAE	<i>Dalea purpurea</i> Vent	DAPU1	Y	
FABACEAE	<i>Glycyrrhiza lepidota</i> Pursh.	GLLE1	Y	FACU
FABACEAE	<i>Thermopsis rhombifolia</i> var. <i>divaricarpa</i> (Nels.) Isely	THRH1	Y	FACU
GERANIACEAE	<i>Geranium caespitosum</i> James ssp. <i>caespitosum</i>	GECA1	Y	
GROSSULARIACEAE	<i>Ribes aureum</i> Pursh	RIAU1	Y	NI
JUNCACEAE	<i>Juncus balticus</i> Willd.	JUBA1	Y	FACW
JUNCACEAE	<i>Juncus dudleyi</i> Wieg.	JUDU1	Y	NI
JUNCACEAE	<i>Juncus ensifolius</i> Wikst. var. <i>montanus</i> (Englm.) C. L. Hitchc.	JUEN1	Y	NI
JUNCACEAE	<i>Juncus nodosus</i> L.	JUNO1	Y	OBL
JUNCACEAE	<i>Juncus torreyi</i> Cov.	JUTO1	Y	FACW
LAMIACEAE	<i>Lycopus americanus</i> Muhl. ex Barton	LYAM1	Y	OBL
LAMIACEAE	<i>Mentha arvensis</i> L.	MEAR1	Y	FACW
LAMIACEAE	<i>Monarda fistulosa</i> L. var. <i>menthifolia</i> (Grah.) Fern.	MOFI1	Y	FACU-
LAMIACEAE	<i>Nepeta cataria</i> L.	NECA1	N	FACU
LAMIACEAE	<i>Prunella vulgaris</i> L.	PRVU1	Y	FAC
LILIACEAE	<i>Calochortus gunnisonii</i> S. Wats.	CAGU1	Y	
LINACEAE	<i>Linum perenne</i> L. var. <i>lewisii</i> (Pursh.) Eat. & Wright	LIPE1	Y	

TABLE 17. (cont.)

Family	Scientific Name	Spec Code	Native	Wetland Indicator
NYCTAGINACEAE	<i>Mirabilis hirsuta</i> (Pursh.) MacM.	MIH1	Y	
NYCTAGINACEAE	<i>Mirabilis linearis</i> (Pursh.) Heimerl	MIL1	Y	NI
NYCTAGINACEAE	<i>Mirabilis nyctaginea</i> (Michx.) MacM.	MINY1	Y	UPL
ONAGRACEAE	<i>Epilobium ciliatum</i> Raf. ssp. glandulosum (Lehm.) Hock & Raven	EPC1	Y	OBL
ONAGRACEAE	<i>Epilobium paniculatum</i> Nutt.	EPPA1	Y	NI
ONAGRACEAE	<i>Gaura parviflora</i> Dougl.	GAPA1	Y	UPL
ONAGRACEAE	<i>Oenothera villosa</i> Thunb. ssp. strigosa (Rydb.) Dietrich & Raven	OEVI1	Y	NI
ORCHIDACEAE	<i>Habenaria hyperborea</i> (L.) R. Br.	HAHY1	Y	FACW
OXALIDACEAE	<i>Oxalis dillenii</i> Jacq.	OXDI1	N	NI
PLANTAGINACEAE	<i>Plantago major</i> L.	PLMA1	N	FAC
POACEAE	<i>Agropyron intermedium</i> (Host) Beauv.	AGIN1	N	
POACEAE	<i>Agropyron repens</i> (L.) Beauv.	AGRE1	N	FAC
POACEAE	<i>Agropyron smithii</i> Rydb.	AGSM1	Y	FACU
POACEAE	<i>Agrostis stolonifera</i> L.	AGST1	N	FACW
POACEAE	<i>Andropogon gerardii</i> Vitman	ANGE1	Y	FAC-
POACEAE	<i>Bouteloua gracilis</i> (H. B. K.) Lag ex Griffiths	BOGR1	Y	
POACEAE	<i>Bouteloua hirsuta</i> Lag	BOH1	Y	
POACEAE	<i>Bromus inermis</i> Leyss. ssp. inermis	BRIN1	N	FACU
POACEAE	<i>Bromus japonicus</i> Thunb. ex Murr.	BRJA1	N	FACU
POACEAE	<i>Bromus tectorum</i> L.	BRTE1	N	
POACEAE	<i>Dichanthelium oligosanthos</i> (Schultz) Gould var. <i>scribnerianum</i> (Nash) Gou	DIOL1	Y	FACU
POACEAE	<i>Elymus canadensis</i> L.	ELCA1	Y	FACU
POACEAE	<i>Glyceria striata</i> (Lam.) Hitchc.	GLST1	Y	OBL
POACEAE	<i>Leersia oryzoides</i> (L.) Sw.	LEOR1	Y	OBL
POACEAE	<i>Muhlenbergia asperifolia</i> (Nees. & May.) Parodi	MUAS1	Y	FACW
POACEAE	<i>Panicum virgatum</i> L.	PAVI1	Y	FAC
POACEAE	<i>Poa compressa</i> L.	POCO1	N	FACU
POACEAE	<i>Poa palustris</i> L.	POPA1	N	FACU
POACEAE	<i>Poa pratensis</i> L.	POPR1	N	FACU
POACEAE	<i>Spartina pectinata</i> Link	SPPE1	Y	FACW
POACEAE	<i>Sporobolus asper</i> (Michx.) Kunth	SPAS1	Y	FACU
POACEAE	<i>Stipa viridula</i> Trin.	STVI1	Y	
POLYGONACEAE	<i>Polygonum convolvulus</i> L.	POCO2	N	FACU
POLYGONACEAE	<i>Rumex crispus</i> L.	RUCR1	N	FACW
POLYGONACEAE	<i>Rumex salicifolius</i> Weinm. ssp. <i>triangulivalvis</i> Danser	RUSA1	Y	NI
PRIMULACEAE	<i>Lysimachia ciliata</i> L.	LYCI1	Y	FACW
RANUNCULACEAE	<i>Ranunculus macounii</i> Britt.	RAMA1	Y	OBL
ROSACEAE	<i>Agrimonia striata</i> Michx.	AGST2	Y	FACU
ROSACEAE	<i>Crataegus erythropoda</i> Ashe	CRER1	Y	NI
ROSACEAE	<i>Geum macrophyllum</i> Willd.	GEMA1	Y	OBL
ROSACEAE	<i>Potentilla frissa</i> Nutt.	POFI1	Y	
ROSACEAE	<i>Potentilla gracilis</i> Dougl. ex Hook. var. <i>glabrata</i> (Lehm.) C. L. Hitchc.	POGR1	Y	NI
ROSACEAE	<i>Potentilla hippiana</i> Lehm.	POHI1	Y	
ROSACEAE	<i>Potentilla pulcherrima</i> x <i>hippiana</i>	POPU1	Y	
ROSACEAE	<i>Prunus virginiana</i> L. var. <i>melanocarpa</i> (A. Nels.) Sarg.	PRVI1	Y	FACU
ROSACEAE	<i>Rosa arkansana</i> Porter	ROAR1	Y	FACU
ROSACEAE	<i>Rosa woodsii</i> Lindl.	ROWO1	Y	FACU
RUBIACEAE	<i>Galium aparine</i> L.	GAAP1	Y	FACU
SALICACEAE	<i>Populus angustifolia</i> James	POAN3	Y	FACW
SALICACEAE	<i>Populus deltoides</i> Marsh. ssp. <i>monilifera</i> (Ait.) Eckenw.	PODE1	Y	FAC
SALICACEAE	<i>Salix amygdaloides</i> Anderss.	SAAM1	Y	FACW
SALICACEAE	<i>Salix exigua</i> Nutt. ssp. <i>interior</i> (Rowlee) Cronq.	SAEX1	Y	OBL
SALICACEAE	<i>Salix irrorata</i> Andersson	SAIR1	Y	NI
SANTALACEAE	<i>Comandra umbellata</i> (L.) Nutt.	COUM1	Y	UPL

TABLE 17. (cont.)

Family	Scientific Name	Spec Code	Native	Wetland Indicator
SCROPHULARIACEAE	<i>Linaria dalmatica</i> (L.) Mill.	LIDA1	N	
SCROPHULARIACEAE	<i>Scrophularia lanceolata</i> Pursh.	SCLA2	Y	FAC
SCROPHULARIACEAE	<i>Verbascum blattaria</i> L.	VEBL1	N	UPL
SCROPHULARIACEAE	<i>Verbascum thapsus</i> L.	VETH1	N	NI
SCROPHULARIACEAE	<i>Veronica americana</i> (Ref.) Schwein. ex Benth.	VEAM1	Y	OBL
SCROPHULARIACEAE	<i>Veronica anagallis-aquatica</i> L.	VEAN1	N	OBL
TYPHACEAE	<i>Typha latifolia</i> L.	TYLA1	Y	OBL
VERBENACEAE	<i>Verbena bracteata</i> Lag. & Rodr.	VEBR1	Y	FACU
VERBENACEAE	<i>Verbena hastata</i> L.	VEHA1	Y	FACW

Total Number of Species = 133

73% Native species

Percent	
Wetland Indicator	of Total
Blank	23
FACU	18
OBL	21
FACW	16
NI	11
FAC	11
UPL	4
FACU	2
FAC	1

See Appendix B for wetland indicator codes.

TABLE 18. 1997 SPECIES RICHNESS AT NON-SUCCESSFUL SITES

Family	Scientific Name	Spec Code	Native	Wetland Indicator
ALISMATACEAE	<i>Alisma trivale</i> Pursh	ALTR1	Y	NI
APIACEAE	<i>Conium maculatum</i> L.	COMA1	N	FACW
APOCYNACEAE	<i>Apocynum cannabinum</i> L.	APCA1	Y	FAC
ASCLEPIADACEAE	<i>Asclepias incarnata</i> L.	ASIN1	Y	OBL
ASCLEPIADACEAE	<i>Asclepias speciosa</i> Torr.	ASSP1	Y	FAC
ASTERACEAE	<i>Achillea millefolium</i> L. ssp. <i>lanulosa</i> (Nutt.) Piper	ACMI1	Y	FACU
ASTERACEAE	<i>Ambrosia psilostachya</i> DC.	AMPS1	Y	FAC
ASTERACEAE	<i>Ambrosia trifida</i> L.	AMTR1	Y	FACW
ASTERACEAE	<i>Artemisia dracuncululus</i> L.	ARDR1	Y	
ASTERACEAE	<i>Artemisia frigida</i> Willd.	ARFR1	Y	
ASTERACEAE	<i>Artemisia ludoviciana</i> Nutt. var. <i>ludoviciana</i>	ARLU1	Y	FACU-
ASTERACEAE	<i>Aster falcatus</i> Lindl.	ASFA1	Y	FAC
ASTERACEAE	<i>Aster hesperius</i> A. Gray var. <i>hesperius</i>	ASHE1	Y	OBL
ASTERACEAE	<i>Aster porteri</i> Gray	ASPO1	Y	NI
ASTERACEAE	<i>Carduus nutans</i> L. ssp. <i>macrolepis</i> (Peters.) Kazmi	CANU1	N	
ASTERACEAE	<i>Centaurea diffusa</i> Lam.	CEDI1	N	
ASTERACEAE	<i>Chrysanthemum leucanthemum</i> L.	CHLE1	N	NI
ASTERACEAE	<i>Chrysopsis villosa</i> Pursh.	CHVI1	Y	
ASTERACEAE	<i>Cichorium intybus</i> L.	CIIN1	N	NI
ASTERACEAE	<i>Cirsium arvense</i> (L.) Scop.	CIAR1	N	FACU
ASTERACEAE	<i>Cirsium undulatum</i> (Nutt.) Spreng.	CIUN1	Y	FACU
ASTERACEAE	<i>Erigeron divergens</i> T. & G.	ERDI1	Y	
ASTERACEAE	<i>Grindelia squarrosa</i> (Pursh.) Dun.	GRSQ1	Y	FACU-
ASTERACEAE	<i>Gutierrezia sarothrae</i> (Pursh.) Britt. & Rusby	GUSA1	Y	
ASTERACEAE	<i>Helianthus annuus</i> L.	HEAN1	Y	FACU
ASTERACEAE	<i>Kuhnia eupatorioides</i> L.	KUEU1	Y	
ASTERACEAE	<i>Lactuca serriola</i> L.	LASE1	N	FAC
ASTERACEAE	<i>Scorzonera laciniata</i> L.	SCLA1	N	
ASTERACEAE	<i>Solidago gigantea</i> Ait.	SOGI1	Y	FACW
ASTERACEAE	<i>Solidago missouriensis</i> Nutt.	SOMI1	Y	
ASTERACEAE	<i>Sonchus asper</i> (L.) Hill	SOAS1	N	FACW
ASTERACEAE	<i>Taraxacum officinale</i> Weber	TAOF1	N	FACU
ASTERACEAE	<i>Tragopogon dubius</i> Scop.	TRDU1	N	
BORAGINACEAE	<i>Cynoglossum officinale</i> L.	CYOF1	N	NI
BORAGINACEAE	<i>Mertensia lanceolata</i> (Pursh.) A. DC.	MELA1	Y	
BORAGINACEAE	<i>Onosmodium molle</i> Michx. var. <i>occidentale</i> (Mack.) Johnston	ONMO1	Y	
BRASSICACEAE	<i>Alyssum alyssoides</i> (L.) L.	ALAL1	N	
BRASSICACEAE	<i>Alyssum minus</i> (L.) Rothmaler var. <i>micranthus</i> (C. A. Mey.) Dudley	ALMI1	N	
BRASSICACEAE	<i>Arabis glabra</i> (L.) Bernh.	ARGL1	N	
BRASSICACEAE	<i>Barbarea vulgaris</i> R. Br.	BAVU1	N	FAC
BRASSICACEAE	<i>Camelina microcarpa</i> Andr. ex DC.	CAMI1	N	NI
BRASSICACEAE	<i>Descurainia pinnata</i> (Walt.) Britt.	DEPI1	Y	
BRASSICACEAE	<i>Descurainia richardsonii</i> (Sweet) Schultz	DERI1	Y	NI
BRASSICACEAE	<i>Erysimum capitatum</i> (Nutt.) DC.	ERCA2	Y	
BRASSICACEAE	<i>Lepidium campestre</i> (L.) R. Br.	LECA1	N	
BRASSICACEAE	<i>Sisymbrium altissimum</i> L.	SIAL1	N	FACU
BRASSICACEAE	<i>Thlaspi arvense</i> L.	THAR1	N	FACU
CACTACEAE	<i>Echinocereus viridiflorus</i> Engelm.	ECVI1	Y	
CACTACEAE	<i>Opuntia fragilis</i> (Nutt.) Haw.	OPFR1	Y	
CACTACEAE	<i>Opuntia macrorhiza</i> Engelm.	OPMA1	Y	
CAPRIFOLIACEAE	<i>Symphoricarpos occidentalis</i> Hook.	SYOC1	Y	NI
CARYOPHYLLACEAE	<i>Cerastium arvense</i> L.	CEAR1	Y	FACU
CHENOPODIACEAE	<i>Salsola iberica</i> Senn. & Pau.	SAIB1	N	FACU
CLUSIACEAE	<i>Hypericum perforatum</i> L.	HYPE1	N	
COMMELINACEAE	<i>Tradescantia occidentalis</i> (Britt.) Smyth	TROC1	Y	UPL
CONVOLVULACEAE	<i>Convolvulus arvensis</i> L.	COAR1	N	
CUPRESSACEAE	<i>Juniperus scopulorum</i> Sarg.	JUSC1	T	
CYPERACEAE	<i>Carex brevior</i> (Dew.) Mack. ex Lunell.	CABR1	Y	FAC
CYPERACEAE	<i>Carex heliophila</i> Mack.	CAHE1	Y	
CYPERACEAE	<i>Carex interior</i> Bailey	CAIN1	Y	OBL
CYPERACEAE	<i>Carex lanuginosa</i> Michx.	CALA1	Y	OBL
CYPERACEAE	<i>Carex nebrascensis</i> Dew.	CANE1	Y	OBL
CYPERACEAE	<i>Carex praegracilis</i> W. Boott.	CAPR1	Y	FACW
CYPERACEAE	<i>Carex scoparia</i> Schkuhr. ex Willd.	CASC1	Y	FACW
CYPERACEAE	<i>Carex simulata</i> Mack.	CASI1	Y	NI
CYPERACEAE	<i>Eleocharis macrostachya</i> Britt.	ELMA1	Y	OBL
CYPERACEAE	<i>Scirpus pallidus</i> (Britt.) Fern	SCPA1	Y	OBL
CYPERACEAE	<i>Scirpus validus</i> Vahl.	SCVA1	Y	OBL

TABLE 18. (cont.)

Family	Scientific Name	Spec Code	Native	Wetland Indicator
EQUISETACEAE	Equisetum laevigatum A. Br.	EQLA1	Y	FACW
FABACEAE	Amorpha fruticosa L.	AMFR1	Y	OBL
FABACEAE	Astragalus canadensis L.	ASCA1	Y	FACU
FABACEAE	Melilotus alba Medic.	MEAL1	N	FACU
FABACEAE	Melilotus officinalis (L.) Pall.	MEOF1	N	FACU
FABACEAE	Psoralea tenuiflora Pursh.	PSTE1	Y	
FABACEAE	Thermopsis rhombifolia var. divaricarpa (Nels.) Isely	THRH1	Y	FACU
GERANIACEAE	Erodium cicutarium (L.) L'Her.	ERIC1	N	
GERANIACEAE	Geranium caespitosum James ssp. caespitosum	GECA1	Y	
HYDROPHYLLACEAE	Phacelia heterophylla Pursh.	PHHE1	Y	NI
JUNCACEAE	Juncus balticus Willd.	JUBA1	Y	FACW
JUNCACEAE	Juncus dudleyi Wieg.	JUDU1	Y	NI
JUNCACEAE	Juncus interior Wieg.	JUIN1	Y	FAC
JUNCACEAE	Juncus torreyi Cov.	JUTO1	Y	FACW
LAMIACEAE	Lycopus americanus Muhl. ex Barton	LYAM1	Y	OBL
LAMIACEAE	Mentha arvensis L.	MEAR1	Y	FACW
LAMIACEAE	Monarda fistulosa L. var. menthifolia (Grah.) Fern.	MOFI1	Y	FACU-
LAMIACEAE	Nepeta cataria L.	NECA1	N	FACU
LAMIACEAE	Prunella vulgaris L.	PRVU1	Y	FAC
LEMNACEAE	Lemna minor L.	LEMI1	Y	OBL
LILIACEAE	Allium textile A. Nels. & Macbr.	ALTE1	Y	
LILIACEAE	Calochortus gunnisonii S. Wats.	CAGU1	Y	
LILIACEAE	Smilacina stellata (L.) Desf.	SMST1	Y	FAC
MALVACEAE	Sphaeralcea coccinea (Pursh.) Rydb.	SPCO1	Y	
NYCTAGINACEAE	Mirabilis hirsuta (Pursh.) MacM.	MIHI1	Y	
NYCTAGINACEAE	Mirabilis linearis (Pursh.) Heimerl	MILI1	Y	NI
NYCTAGINACEAE	Mirabilis nyctaginea (Michx.) MacM.	MINY1	Y	UPL
ONAGRACEAE	Epilobium ciliatum Raf. ssp. glandulosum (Lehm.) Hock & Raven	EPCI1	Y	OBL
ONAGRACEAE	Epilobium paniculatum Nutt.	EPPA1	Y	NI
ONAGRACEAE	Gaura parviflora Dougl.	GAPA1	Y	UPL
ONAGRACEAE	Oenothera villosa Thunb. ssp. strigosa (Rydb.) Dietrich & Raven	OEVI1	Y	NI
OXALIDACEAE	Oxalis dillenii Jacq.	OXDI1	N	NI
PAPAVERACEAE	Argemone polyanthemos (Fedde) G. Ownbey	ARPO1	Y	
PLANTAGINACEAE	Plantago lanceolata L.	PLLA1	N	FAC
PLANTAGINACEAE	Plantago major L.	PLMA1	N	FAC
POACEAE	Agropyron cristatum (L.) Gaertn.	AGCR1	N	
POACEAE	Agropyron desertorum (Fisch.) Schult.	AGDE1	N	
POACEAE	Agropyron intermedium (Host) Beauv.	AGIN1	N	
POACEAE	Agropyron repens (L.) Beauv.	AGRE1	N	FAC
POACEAE	Agropyron smithii Rydb.	AGSM1	Y	FACU
POACEAE	Agropyron spicatum (Pursh) Scribn. and Sm.	AGSP1	Y	UPL
POACEAE	Agrostis stolonifera L.	AGST1	N	FACW
POACEAE	Andropogon gerardii Vitman	ANGE1	Y	FAC-
POACEAE	Apera interrupta (L.) Beauvois	APIN1	N	
POACEAE	Aristida purpurea Nutt. var. robusta (Merrill) A. Holmgren & N. Holm	ARLO1	Y	
POACEAE	Bouteloua gracilis (H. B. K.) Lag ex Griffiths	BOGR1	Y	
POACEAE	Bouteloua hirsuta Lag	BOHI1	Y	
POACEAE	Bromus inermis Leyss. ssp. inermis	BRIN1	N	FACU
POACEAE	Bromus japonicus Thunb. ex Murr.	BRJA1	N	FACU
POACEAE	Bromus tectorum L.	BRTE1	N	
POACEAE	Dactylis glomerata L.	DAGL1	N	FACU
POACEAE	Elymus canadensis L.	ELCA1	Y	FACU
POACEAE	Festuca pratensis Huds.	FEPR1	Y	FAC
POACEAE	Glyceria striata (Lam.) Hitchc.	GLST1	Y	OBL
POACEAE	Hordeum jubatum L.	HOJU1	Y	FACW
POACEAE	Koeleria pyramidata (Lam.) Beauv.	KOPY1	Y	
POACEAE	Leersia oryzoides (L.) Sw.	LEOR1	Y	OBL
POACEAE	Muhlenbergia asperifolia (Nees. & Mey.) Parodi	MUAS1	Y	FACW
POACEAE	Muhlenbergia racemosa (Michx.) B. S. P.	MURA1	Y	FACW
POACEAE	Panicum virgatum L.	PAVI1	Y	FAC
POACEAE	Phleum pratense L.	PHPR1	N	FACU
POACEAE	Poa compressa L.	POCO1	N	FACU
POACEAE	Poa palustris L.	POPA1	N	FACU
POACEAE	Poa pratensis L.	POPR1	N	FACU
POACEAE	Polypogon monspeliensis (L.) Desf.	POMO1	N	OBL
POACEAE	Spartina pectinata Link	SPPE1	Y	FACW
POACEAE	Sporobolus cryptandrus (Torr.) A. Gray	SPCR1	Y	FACU-
POACEAE	Stipa comata Trin. & Rupr.	STCO1	Y	

TABLE 18. (cont.)

Family	Scientific Name	Spec Code	Native	Wetland Indicator
POACEAE	<i>Stipa viridula</i> Trin.	STVI1	Y	
POLYGONACEAE	<i>Polygonum convolvulus</i> L.	POCO2	N	FACU
POLYGONACEAE	<i>Rumex crispus</i> L.	RUCR1	N	FACW
POLYGONACEAE	<i>Rumex salicifolius</i> Weinm. ssp. <i>triangulivalvis</i> Danser	RUSA1	Y	NI
RANUNCULACEAE	<i>Ranunculus macounii</i> Britt.	RAMA1	Y	OBL
ROSACEAE	<i>Agrimonia striata</i> Michx.	AGST2	Y	FACU
ROSACEAE	<i>Crataegus erythropoda</i> Ashe	CRER1	Y	NI
ROSACEAE	<i>Crataegus succulenta</i> Link var. <i>occidentalis</i> (Britton) E. J. Palm.	CRSU1	Y	
ROSACEAE	<i>Geum aleppicum</i> Jacq.	GEAL1	Y	FACU
ROSACEAE	<i>Geum macrophyllum</i> Willd.	GEMA1	Y	OBL
ROSACEAE	<i>Potentilla frissa</i> Nutt.	POFI1	Y	
ROSACEAE	<i>Potentilla gracilis</i> Dougl. ex Hook. var. <i>glabrata</i> (Lehm.) C. L. Hitchc.	POGR1	Y	NI
ROSACEAE	<i>Prunus americana</i> Marsh.	PRAM1	Y	UPL
ROSACEAE	<i>Prunus virginiana</i> L. var. <i>melanocarpa</i> (A. Nels.) Sarg.	PRVI1	Y	FACU
ROSACEAE	<i>Rosa acicularis</i> Lindl.	ROAC1	Y	FACU
ROSACEAE	<i>Rosa arkansana</i> Porter	ROAR1	Y	FACU
ROSACEAE	<i>Rosa woodsii</i> Lindl.	ROWO1	Y	FACU
RUBIACEAE	<i>Galium aparine</i> L.	GAAP1	Y	FACU
RUBIACEAE	<i>Galium septentrionale</i> Roemer & Schultes	GASE1	Y	FAC
SALICACEAE	<i>Populus deltoides</i> Marsh. ssp. <i>monilifera</i> (Ait.) Eckenw.	PODE1	Y	FAC
SALICACEAE	<i>Salix amygdaloides</i> Anderss.	SAAM1	Y	FACW
SALICACEAE	<i>Salix exigua</i> Nutt. ssp. <i>interior</i> (Rowlee) Cronq.	SAEX1	Y	OBL
SALICACEAE	<i>Salix lutea</i> Nutt.	SALU1	Y	FACW
SANTALACEAE	<i>Comandra umbellata</i> (L.) Nutt.	COUM1	Y	UPL
SCROPHULARIACEAE	<i>Linaria dalmatica</i> (L.) Mill.	LIDA1	N	
SCROPHULARIACEAE	<i>Penstemon virens</i> Penn.	PEVI1	Y	
SCROPHULARIACEAE	<i>Scrophularia lanceolata</i> Pursh.	SCLA2	Y	FAC
SCROPHULARIACEAE	<i>Verbascum blattaria</i> L.	VEBL1	N	UPL
SCROPHULARIACEAE	<i>Verbascum thapsus</i> L.	VETH1	N	NI
SCROPHULARIACEAE	<i>Veronica americana</i> (Ref.) Schwein. ex Benth.	VEAM1	Y	OBL
SCROPHULARIACEAE	<i>Veronica anagallis-aquatica</i> L.	VEAN1	N	OBL
SOLANACEAE	<i>Physalis heterophylla</i> Nees	PHHE2	Y	
SOLANACEAE	<i>Physalis virginiana</i> P. Mill.	PHVI2	Y	
TYPHACEAE	<i>Typha angustifolia</i> L.	TYAN1	Y	OBL
TYPHACEAE	<i>Typha latifolia</i> L.	TYLA1	Y	OBL
VERBENACEAE	<i>Verbena bracteata</i> Lag. & Rodr.	VEBR1	Y	FACU
VERBENACEAE	<i>Verbena hastata</i> L.	VEHA1	Y	FACW

Total Number of Species = 173

71% Native species
Percent

See Appendix B for wetland indicator codes.

Wetland Indicator	of Total
Blank	29
FACU	18
OBL	131
FACW	11
NI	11
FAC	10
UPL	4
FACU-	2
FAC-	1

**TABLE 19. 1997 PERCENT COVER OF SELECTED WOODY SPECIES
AT SUCCESSFUL VS. NON-SUCCESSFUL SITES**

Species	Successful Sites O	Non-successful Sites O
<i>Amorpha fruticosa</i>	18.85	20.33
<i>Salix exigua</i>	38.48	9.66
<i>Populus deltoides</i>	6.06	6.50
<i>Salix amygdaloides</i>	2.96	1.54
<i>Symphoricarpos occidentalis</i>	5.88	3.24
<i>Rosa arkansana</i>	0.43	1.89
<i>Prunus virginiana</i>	1.10	0.61

See Appendix B for cover class system used.

TABLE 20. 1997 STEM DENSITIES AT SUCCESSFUL SITES

Scientific Name	Stem Density Class					Frequency	Percent Frequency
	1	2	3	4	5		
<i>Amorpha fruticosa</i>	2	19	15	2		38	95
<i>Salix exigua</i>	3	5	11	10	7	36	90
<i>Symphoricarpos occidentalis</i>	3	10	9	3	1	26	65
<i>Prunus virginiana</i>	2	6				8	20
<i>Rosa arkansana</i>	2	4	1			7	17.5
<i>Salix amygdaloides</i>	6		1			7	17.5
<i>Populus deltoides</i>	3					3	7.5
<i>Salix irrorata</i>	1		1			2	5
<i>Crataegus erythropoda</i>	1	1				2	5
<i>Ribes aureum</i>	1	1				2	5
<i>Juniperus scopulorum</i>	1					1	2.5
<i>Rus aromatica</i>		1				1	2.5
<i>Rosa woodsii</i>	1					1	2.5

See Appendix B for stem density classes.

TABLE 21. 1997 STEM DENSITIES AT NON-SUCCESSFUL SITES

Scientific Name	Stem Density Class					Frequency	Percent Frequency
	1	2	3	4	5		
<i>Amorpha fruticosa</i>	5	6	6	8		25	50
<i>Symphoricarpos occidentalis</i>	7	5	3	4		19	38
<i>Salix exigua</i>	4	3	2	1	3	13	26
<i>Prunus virginiana</i>	10	1	1			12	24
<i>Rosa arkansana</i>	3	2	1	3		9	18
<i>Populus deltoides</i>	6					6	12
<i>Salix amygdaloides</i>	4	1				5	10
<i>Crataegus succulenta</i>	3					3	6
<i>Prunus americana</i>	1	1				2	4
<i>Rosa woodsii</i>		2				2	4
<i>Crataegus erythropoda</i>	1					1	2
<i>Juniperus scopulorum</i>	1					1	2
<i>Rosa acicularis</i>		1				1	2

See Appendix B for stem density classes.

TABLE 22. 1997 DENSITY DISTRIBUTIONS - SUCCESSFUL SITES

Scientific Name	Density Distribution Class									Frequency	Percent Frequency
	1	2	3	4	5	6	7	8	9		
<i>Amorpha fruticosa</i>			3	3	17	11	2	2		38	95.00
<i>Salix exigua</i>			4		10	8	1	12	1	36	90.00
<i>Symphoricarpos occidentalis</i>		1	10	2	5	8				26	65.00
<i>Salix amygdaloides</i>	3		7		2					12	30.00
<i>Prunus virginiana</i>		1	6		1					8	20.00
<i>Rosa arkansana</i>		1	2	2	2					7	17.50
<i>Populus deltoides</i>	1	2	2							5	12.50
<i>Salix irrorata</i>		1	1		1					3	7.50
<i>Crataegus erythropoda</i>			1		1					2	5.00
<i>Ribes aureum</i>		1	1							2	5.00
<i>Acer negundo</i>			1							1	2.50
<i>Juniperus scopulorum</i>	1									1	2.50
<i>Populus angustifolia</i>	1									1	2.50
<i>Rhus aromatica</i>			1							1	2.50
<i>Rosa woodsii</i>	1									1	2.50

See Appendix B for density distribution table and illustrations.

TABLE 23. 1997 DENSITY DISTRIBUTIONS - NON-SUCCESSFUL SITES

Scientific Name	Density Distribution Class									Frequency	Percent Frequency
	1	2	3	4	5	6	7	8	9		
<i>Amorpha fruticosa</i>	1	1	4	4	4	3	3	5		25	50.00
<i>Symphoricarpos occidentalis</i>		1	8	2	5	2	1			19	38.00
<i>Salix exigua</i>	1	1	3		5		1	1	1	13	26.00
<i>Prunus virginiana</i>	3	2	4	1	2					12	24.00
<i>Populus deltoides</i>	3	1	5		1					10	20.00
<i>Rosa arkansana</i>			2	3	2	2				9	18.00
<i>Salix amygdaloides</i>	2		1	2	1					6	12.00
<i>Crataegus succulenta</i>		1	1	1						3	6.00
<i>Prunus americana</i>				2						2	4.00
<i>Rosa woodsii</i>			2							2	4.00
<i>Crataegus erythropoda</i>			1							1	2.00
<i>Juniperus scopulorum</i>	1									1	2.00
<i>Rosa acicularis</i>					1					1	2.00
<i>Salix lutea</i>			1							1	2.00

See Appendix B for density distribution table and illustrations.

**TABLE 24. 1997 MEAN HEIGHTS (cm) OF SELECTED WOODY SPECIES
AT SUCCESSFUL VS. NON-SUCCESSFUL SITES**

Species	Successful Sites		Non-Successful Sites	
	O	F	O	F
<i>Amorpha fruticosa</i>	127.87 a	28.84	121.48 a	35.39
<i>Salix exigua</i>	194.75 a	55.81	160.15 a	71.38
<i>Populus deltoides</i>	1227.60 a	262.87	622.70 a	607.28
<i>Salix amygdaloides</i>	302.92 a	130.79	163.83 a	120.25
<i>Symphoricarpos occidentalis</i>	65.92 a	17.29	56.95 a	14.72
<i>Rosa arkansana</i>	49.71 a	14.57	51.33 a	18.74
<i>Prunus virginiana</i>	124.38 a	59.95	46.75 b	43.20

Means with the same letters are not significantly different at the 0.05 level using a Mann-Whitney W test.

**TABLE 25. MICROSITE HABITAT CHARACTERIZATION SUMMARY FOR PREBLE'S MOUSE HABITAT
SUMMER 1997, SUMMER 1996, SPRING 1996, AND FALL 1995**

	Summer 1997	Summer 1996	Spring 1996	Fall 1995
Slope angle (°)	2-10	2-26	1-40	1-65
Slope aspect	see Fig. 9	see Fig. 9	see Fig. 9	see Fig. 9
Slope position*	R, B	R	R, B, M	R, B, M
Distance to stream (m)	NA	0-0.5 (0.1)	0-25 (9.5)	0-35 (8.6)
Distance to embankment (m)	0.5-19.6 (7.0)	3-5.5 (3.9)	0-25 (8)	0-20 (4.1)
Distance to canopy edge (m)	0-0.5 (0.07)	0 (0.0)	0-15 (2.3)	0-73 (7.7)
Stem densities (stems/m ²)				
<i>Symphoricarpos occidentalis</i>	1-4*	NA	6.61	3.1
<i>Salix exigua</i>	3-5*	NA	1.61	2.89
<i>Rosa arkansana</i>	1-3*	NA	0.7	0.91
<i>Prunus virginiana</i>	2*	NA	0.2	0.47
<i>Amorpha fruticosa</i>	1-4*	NA	0.17	0.59
<i>Rhus aromatica</i>	2*	NA	0.12	0.02
Tree and shrub density distributions ^b				
<i>Salix exigua</i>	5-8	7-8	NA	NA
<i>Amorpha fruticosa</i>	3-8	4-7	NA	NA
<i>Rosa arkansana</i>	2-5	4-5	NA	NA
<i>Symphoricarpos occidentalis</i>	3-6	0-3	NA	NA
<i>Prunus virginiana</i>	5	0-3	NA	NA
<i>Populus deltoides</i>	3	NA	NA	NA
<i>Salix amygdaloides</i>	1-5	NA	NA	NA
<i>Rhus aromatica</i>	3	NA	NA	NA
Tree and shrub cover amounts ^c				
<i>Salix exigua</i>	15-87.5 (61)	NA	NA	NA
<i>Amorpha fruticosa</i>	1-37.5 (18)	NA	NA	NA
<i>Rosa arkansana</i>	1-3 (0.67)	NA	NA	NA
<i>Symphoricarpos occidentalis</i>	1-37.5 (6.23)	NA	NA	NA
<i>Prunus virginiana</i>	3 (0.2)	NA	NA	NA
<i>Populus deltoides</i>	15 (1.0)	NA	NA	NA
<i>Salix amygdaloides</i>	0.5-37.5 (5.76)	NA	NA	NA

TABLE 25. (cont.)

	Summer 1997	Summer 1996	Spring 1996	Fall 1995
Tree and shrub canopy cover (%)	NA	100 ^f	47-68	70
Tree and shrub canopy cover (%) ^d	0-83 (41)	22-91 (75)	NA	NA
Herbaceous density	69-94 (85)	92-98(95)	NA	NA
Herbaceous canopy cover (%)	NA	0 ^f	32-53	30
Tree canopy (%)	0-87.5 (29.5) ^a	NA	0-40 (2.2)	0-70 (10.8)
Shrub canopy (%)	3-87.5 (45.7) ^a	NA	10-100 (51)	0-80(46.8)
Subshrub canopy (%)	0-37.5 (6.5) ^a	NA	NA	NA
Forb cover (%)	1-87.5 (28.7) ^a	NA	NA	NA
Graminoid cover (%)	1-87.5 (31.1) ^a	NA	NA	NA
Soil cover (%)	0.5-37.5 (14.1) ^a	NA	NA	NA
Rock cover (%)	0.5-87.5 (12.1) ^a	NA	NA	NA
Water cover (%)	0-15 (8.4) ^a	NA	NA	NA
Basal vegetation cover (%)	3-37.5 (19.4) ^a	NA	NA	NA
Foliar canopy (%)	NA	37.5-62.5 (50) ^a	30-90 (65.3)	30-80 (49.3)
Litter cover (%) ^a	1-87.5 (37.6) ^a	37.5-62.5 (56.25)	NA	NA
Tree heights (m)	1.5-11.9 (3.77)	11.5-12.3 (11.9)	NA	NA
Shrub heights (m)	0.63-2.80 (1.68)	1.0-2.2 (1.9)	NA	NA
Sub-shrub heights (m)	0.25-1.03 (.65)	0.3-0.8 (0.6)	NA	NA

^a R=Riparian, B=Bottom, M=Middle Slope

^b Density distributions were measured using a density distribution class system.

^c Measured using cover class system. Previously measured based on visual estimations.

^d Measured with spherical crown densiometer in Summer 1996. Previous measured based on visual estimations.

^e Measured using a stem density class system. Previously actual counts were made.

^f Because all of the capture locations were under the canopy of the trees and shrubs there was no herbaceous canopy cover.

Numbers in () = Mean.

Spring 1996 data (Kaiser-Hill, 1996b).

Fall 1995 data (Kaiser-Hill, 1996c).

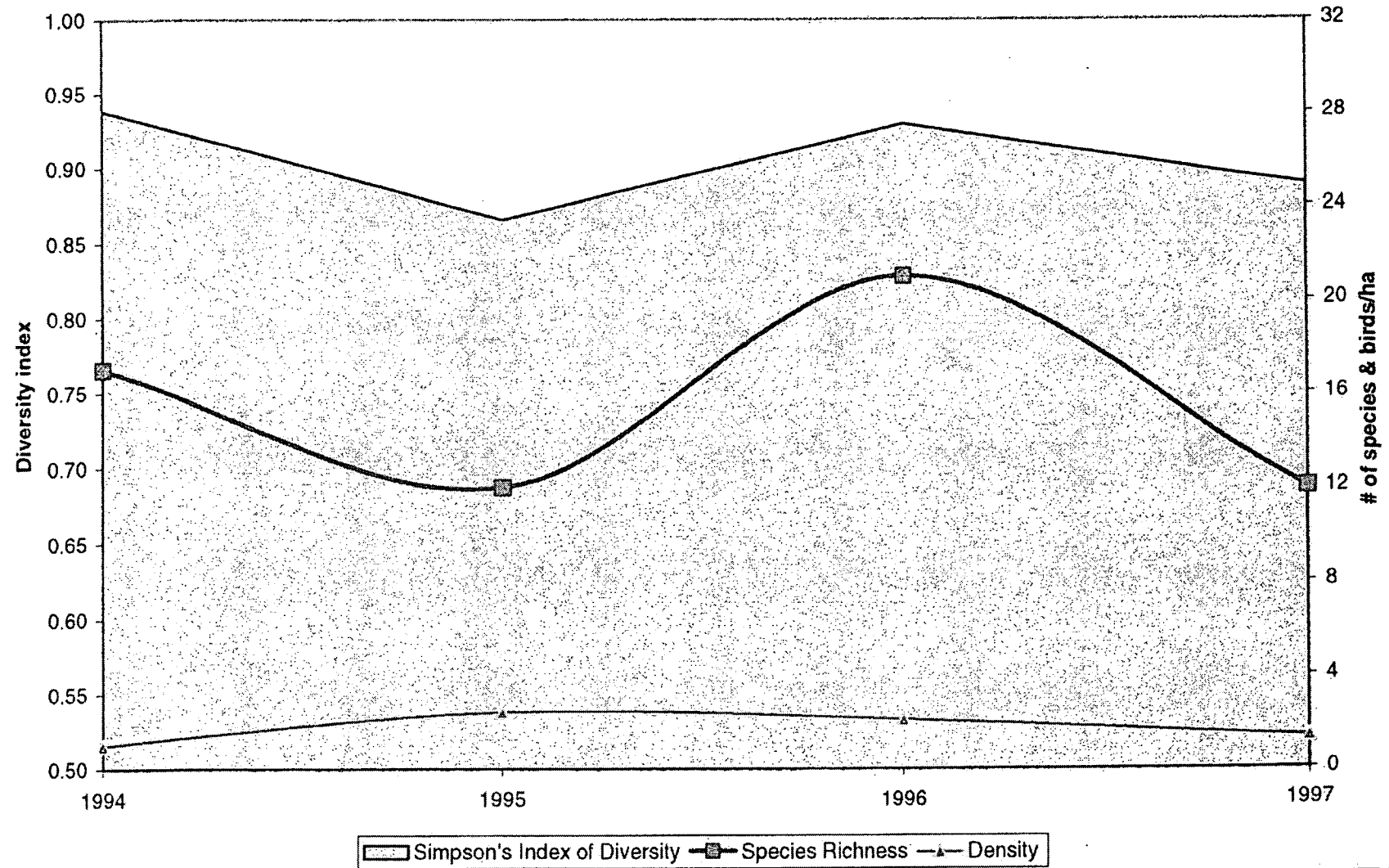
**TABLE 26. SUMMARY OF SLOPE ANGLE MEASUREMENTS
ASSOCIATED WITH PMJM CAPTURES (1997)**

Range (degrees)	1997 All Sites	
	Number	Percent
0-5	8	53
6-10	7	47
11-15	0	0

**TABLE 27. SUMMARY OF SLOPE POSITIONS
ASSOCIATED WITH PMJM CAPTURES (1997)**

Slope Position	1997 All Sites	
	Number	Percent
Riparian	14	93
Bottom	1	7

Fall bird data for WET



**TABLE 28. SUMMARY OF EMBANKMENT DISTANCES
ASSOCIATED WITH PMJM CAPTURES (1997)**

Range (degrees)	1997 All Sites	
	Number	Percent
0-5	9	60
6-10	2	13
11-15	2	13
16-20	2	13
21-25	0	0

TABLE 29. SPEARMAN RANK CORRELATION VALUES FOR DIFFERENT COVER TYPES

Cover Types	Herbaceous Density	Tree/Shrub Canopy	Herbaceous Cover Index	Woody Cover Index	Litter
Herbaceous Density	--	--	--	--	--
Tree/Shrub Canopy	0.5590 (0.0000)	--	--	--	--
Herbaceous Cover Index	0.3062 (0.0039)	-0.2878 (0.0066)	--	--	--
Woody Cover Index	0.6544 (0.0000)	0.7429 (0.0000)	-0.3679 (0.0005)	--	--
Litter	0.182 (0.0860)	0.2058 (0.0522)	0.2150 (0.0425)	0.2589 (0.0146)	--

First value is the Spearman Rank Correlation Value (r_s). Second value in parentheses is the P value.

TABLE 30. SORENSON COEFFICIENT OF SIMILARITY INDICES

Sites	Successful	Non-Successful	Woody	Herbaceous
Successful	--	--	--	--
Non-Successful	0.72	--	--	--
Woody	0.86	0.81	--	--
Herbaceous	0.77	0.90	0.72	--

TABLE 31. 1997 PMJM HABITAT CHARACTERIZATION PARAMETERS

Sample Site:	9772A ^a		9764A ^b		9768A ^c		9769A ^d		9767A ^e		9771A ^f	
Parameters:	O	F	O	F	O	F	O	F	O	F	O	F
# Species/ Trapsite	20.10	7.94	27.90	9.34	29.90	3.41	24.50	4.60	23.90	7.00	32.40	5.97
Herbaceous Density	81.80	13.91	31.60	9.56	79.63	15.81	48.63	32.82	83.08	9.22	43.08	16.38
Tree/Shrub Canopy	23.76	28.15	0.99	3.12	14.40	22.99	2.94	5.72	58.40	26.60	0.21	0.66
Woody Index Value	79.85	36.42	6.10	12.25	71.95	26.96	15.60	17.44	85.25	26.50	29.20	20.68
Herbaceous Index Value	75.15	39.35	101.70	25.15	49.20	18.72	47.15	30.69	50.10	32.18	92.80	40.09
Basal Vegetation Cover	8.60	6.76	16.00	8.51	25.00	13.69	9.80	6.74	20.50	12.35	29.50	20.17
Litter Cover	37.55	31.34	24.00	11.62	39.90	33.78	4.70	11.55	35.90	25.84	12.95	16.96
Rock Cover	14.25	28.40	5.60	6.58	12.30	18.60	27.95	35.86	8.75	19.40	4.95	6.99
Soil Cover	16.50	15.60	2.15	4.59	4.80	11.51	14.60	20.21	9.55	15.38	1.15	1.00
Water Cover	2.95	4.42	3.45	4.23	8.80	6.56	3.40	6.18	12.60	5.06	9.05	11.94

TABLE 31. (cont.)

Sample Site:	9765A ^a		9770A ^b		9766A ^c	
Parameters:	O	F	O	F	O	F
# Species/ Trapsite	29.00	10.83	20.20	4.10	27.50	3.89
Herbaceous Density	66.95	15.64	71.40	26.58	35.28	7.89
Tree/Shrub Canopy	34.55	31.59	12.01	27.74	0.00	0.00
Woody Index Value	78.95	33.61	44.10	27.38	8.75	12.31
Herbaceous Index Value	56.26	37.84	27.15	25.60	93.05	19.78
Basal Vegetation Cover	15.75	12.80	8.75	6.59	17.25	7.12
Litter Cover	25.30	27.86	1.35	0.88	32.55	26.02
Rock Cover	17.90	14.65	9.55	11.58	2.00	1.31
Soil Cover	18.30	26.72	0.95	0.80	1.40	1.13
Water Cover	14.65	9.69	1.50	4.74	1.60	0.97

^a Successful site, woody site, gaining reaches

^b Non-successful site, herbaceous site, gaining reaches

^c Successful site, woody site, losing reaches

^d Non-successful site, herbaceous site, losing reaches

^e Successful site, woody site, two-month gaining reaches

^f Successful site, herbaceous site, two-month gaining reaches

^g Non-successful site, woody site, Successful site, gaining reaches

^h Non-successful site, woody site, unknown reaches

ⁱ Non-successful site, herbaceous site, unknown reaches

TABLE 32. REVISED HYDROTYPE COMPARISONS OF PMJM HABITAT CHARACTERIZATION VARIABLES

Parameters	Hydrotype							
	Herbaceous Gaining		Herbaceous Losing		Woody Gaining		Woody Losing	
	O	F	O	F	O	F	O	F
# Species/Trapsite	27.70 a	6.97	28.45 a	6.58	24.55 a	10.31	24.66 a	6.37
Herbaceous Density	33.44 a	8.74	45.85 a	25.41	74.38 b	16.29	78.03 b	18.65
Tree/Shrub Canopy	0.49 a	2.21	1.57 a	4.20	29.16 b	29.64	28.27 b	33.06
Woody Cover Index	7.43 a	12.03	22.40 a	19.88	79.40 b	34.11	67.10 b	31.31
Herbaceous Cover Index	97.38 a	22.46	69.98 b	41.90	65.70 b	38.80	42.15 b	27.39
Basal Vegetation Cover	16.65 a	7.62	19.80 a	17.63	12.35 a	10.45	18.20 a	12.80
Litter Cover	28.28 a	20.10	8.83 b	14.74	31.43 b	29.54	25.72 b	29.52
Rock Cover	3.80 a	4.97	16.45 a	27.78	16.08 a	22.07	10.20 a	16.37
Soil Cover	1.78 a	3.27	7.88 b	15.54	17.40 b	21.32	5.10 a	11.29
Water Cover	2.53 a	3.14	6.23 a	9.69	8.80 a	9.47	7.63 a	7.09

Means with the same letters are not significantly different at the 0.05 level using a Kruskal-Wallis test.

**TABLE 33. 1997 PERCENT COVER OF SELECTED WOODY SPECIES
BY REVISED HYDROTYPE CATEGORIES**

Species	Hydrotype			
	Herbaceous	Herbaceous	Woody	Woody
	Gaining	Losing	Gaining	Losing
	0	0	0	0
<i>Amorpha fruticosa</i>	0.00	5.14	10.10	23.94
<i>Salix exigua</i>	0.00	1.64	19.33	27.18
<i>Populus deltoides</i>	0.08	0.80	6.38	5.31
<i>Salix amygdaloides</i>	0.00	1.16	1.73	1.61
<i>Symphoricarpos occidentalis</i>	1.40	1.18	3.78	2.76
<i>Rosa arkansana</i>	1.34	0.10	0.28	0.60
<i>Prunus virginiana</i>	0.13	0.38	0.59	0.63

See Appendix B for cover class system used.

TABLE 34. 1997 STEM DENSITIES BY HYDROTYPE - WOODY GAINING

Scientific Name	Stem Density Class					Frequency	Percent Frequency
	1	2	3	4	5		
<i>Amorpha fruticosa</i>	3	9	5	1		18	90
<i>Salix exigua</i>		2	7	2	5	16	80
<i>Symphoricarpos occidentalis</i>	3	5	2	5	1	16	80
<i>Prunus virginiana</i>	5	2	1			8	40
<i>Rosa arkansana</i>	2	3				5	25
<i>Crataegus succulenta</i>	3					3	15
<i>Crataegus erythropoda</i>	2					2	10
<i>Populus deltoides</i>	2					2	10
<i>Prunus americana</i>	1	1				2	10
<i>Juniperus scopulorum</i>	1					1	5
<i>Rosa woodsii</i>	1					1	5
<i>Salix amygdaloides</i>	1					1	5

See Appendix B for stem density classes.

TABLE 35. 1997 STEM DENSITIES BY HYDROTYPE - WOODY LOSING

Scientific Name	Stem Density Class					Frequency	Percent Frequency
	1	2	3	4	5		
<i>Amorpha fruticosa</i>	2	7	13	8		30	100.00
<i>Salix exigua</i>	1	4	4	9	5	23	76.67
<i>Symphoricarpos occidentalis</i>	2	7	4	1		14	46.67
<i>Salix amygdaloides</i>	6		1			7	23.33
<i>Rosa arkansana</i>	1	2	2	1		6	20.00
<i>Prunus virginiana</i>	1	4				5	16.67
<i>Populus deltoides</i>	3					3	10.00
<i>Salix irrorata</i>	1		1			2	6.67
<i>Crataegus erythropoda</i>		1				1	3.33
<i>Rhus aromatica</i>		1				1	3.33
<i>Ribes aureum</i>		1				1	3.33

See Appendix B for stem density classes.

Appendix A

Data Quality and Assurance

TRAPPING

Capture data were recorded only on approved field data sheets entitled Small Mammal Trapping Forms. Once the forms were completed, they were signed and dated by the data recorder. This signature and date serves as a QA check and signifies that the field data sheets had been filled out correctly and completely.

All capture data were entered into the database the week collected. A file was developed specifically for this data and became part of the Ecology database. Each step of the data entry process, including verification and validation, was documented by a signature or initials and a date. The verification process ensures that there was 100 percent agreement for "essential" fields. The validation process ensures that there was 90 percent agreement of 20 percent of the records for all remaining fields.

HABITAT CHARACTERIZATION

Habitat characterization data were recorded on approved field data sheets. The approved field data sheets for trap station habitat characterization are Small Mammal Vegetation Species Richness Forms and Preble's Meadow Jumping Mouse Habitat Characterization Forms.

Preble's Meadow Jumping Mouse Habitat Characterization Forms were designed specifically for PMJM habitat characterization and were used during the 1997 field season. All habitat characterization data were entered into the database within a few weeks of collection and became part of the Ecology Database. Each step of the data entry process, including verification and validation, was documented by a signature or initials and a date. The verification process ensures that there was 100 percent agreement for "essential" fields. The validation process ensures that there was 90 percent agreement of 20 percent of the records for all remaining fields.

Appendix B

Explanation of Habitat Characterization Measures

Appendix B

Explanation of Habitat Characterization Measures and Terms

Figure B-1. Density Distribution Classes

Figure B-2. Slope Positions

Table B-1. Percent Cover Classes

Table B-2. Stem Density Classes

Table B-3. Trap Station Habitat Endpoints

Table B-4. Habitat Type Descriptions Used in 1996 RFETS Vegetation Map

Table B-5. Wetland Indicator Codes and Meanings

Class	Description	Distribution
1	Rare individual, a single occurrence	-
2	A few sporatically occurring individuals	- -
3	A single patch or clump of a species	■
4	Several sporadically occurring individuals	■ ■ ■ ■
5	A few patches or clumps of a species	■ ■ ■ ■
6	Several well spaced patches or clumps	■ ■ ■ ■ ■ ■
7	Continuous uniform occurrence of a species with a few gaps in the distribution	■ ■ ■ ■ ■ ■ ■ ■
8	Continuous occurrence of a species with a few gaps in the distribution	■ ■ ■ ■ ■ ■ ■ ■ ■ ■
9	Continuous dense occurrence of a species	■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■

Source: Robinson et al. 1990

Figure B-1. Density Distribution Classes

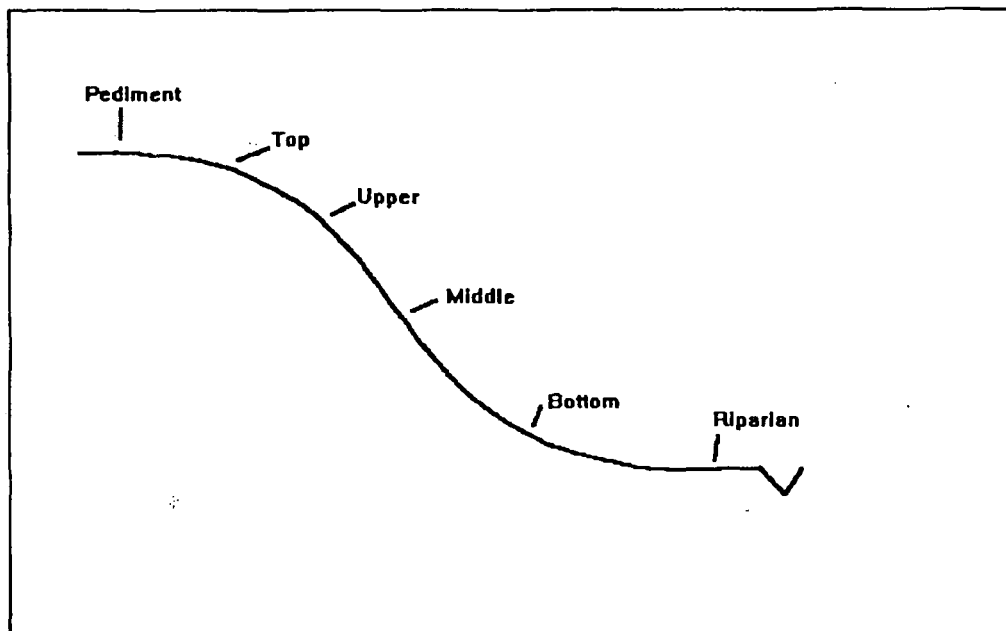


Figure B-2. Slope Positions

Table B-1. Percent Cover Classes				
r	solitary,	with	small	cover
+	few,	with	small	cover
1	numerous,	<	5%	cover
2	5-25%			
3	26-50%			
4	51-75%			
5	>75%			

Table B-2. Stem Density Classes	
0	0 stems per plot
1	1 to 10 stems per plot
2	11 to 50 stems per plot
3	51 to 100 stems per plot
4	101 to 200 stems per plot
5	201+ stems per plot

Table B-3. Trap Station Habitat Endpoints

ENDPOINTS	VARIABLES	METHODS
Slope Angle	0-90 degrees	Clinometer
Slope Aspect	360 degrees	Compass
Slope Position	P, T, U, M, B, R	See Figure B-2.
Moisture Gradient	Hydric, Humic, Mesic, Xeric	
Distance to Stream (m)	Trap to stream edge	meter tape
Distance to Embankment (m)	Other than stream bank	meter tape
Distance to Canopy Edge (m)	nearest contiguous riparian canopy does not include snowberry, rose, or skunkbush sumac	
Habitat Types	Primary, Secondary, Tertiary, Quarternary	use Habitat Codes
Trap Canopy Position	In, Out, Edge	
Tree and Shrub Canopy Cover	Percent of Closure (100=closed)	Spherical Crown Densiometer
Tree Canopy Species	Species Code	RFETS Codes
Shrub Canopy Species	Species Code	RFETS Codes
Tree Canopy Heights	Mean of 5 measures	Clinometer
Shrub Canopy Heights	Mean of 5 measures	Clinometer (or meter stick)
Subshrub Heights	Mean of 5 measures	Meter stick
Stem Densities	Stem Density Class for each shrub species	See Table B-2.
Stem Density Distribution	Density Distribution Class for each shrub species	See Figure B-1.
Herbaceous Vertical Density	Portion of m ² grid	Vegetation Board
Foliar Cover	Cover Classes	
Foliar Canopy Species	Species Code	RFETS Codes
Ground Cover	Cover Classes of soil, rock, litter, grass, forb, shrubs, trees	
Soil Condition	Cobbly, Gravelly, Sandy, Loamy, Silty, Clayey	
Borrowing Opportunities	Low, Medium, High	

TABLE B-4. HABITAT TYPE DESCRIPTIONS USED IN THE 1996 RFETS VEGETATION MAP

000 AQUATIC AND WETLANDS HABITATS GROUP

Terrestrial Subgroup

010 Wet Meadow/Marsh Ecotone

Typified by the presence of *Agrostis stolonifera*, *Spartina pectinata*, or occasionally solid stands of *Poa compressa* or *Agropyron smithii*. Other common plants found in this classification type include *Asclepias speciosa*, *Iris missouriensis*, *Cirsium arvense*, *Rumex* sp., and sometimes *Arnica fulgens*. Soils are usually fine, silty materials with few rocks. These areas are commonly found on the edges of the streams, ponds, seeps, and other wetter areas on Site, often just beyond the short marsh and tall marsh classifications.

020 Short Marsh

Typified by stands of *Carex* sp. and/or *Juncus* sp. This classification is usually wet and underwater for parts of the year. It has fine, muddy soils with few rocks. This classification is predominant in the wetlands at the Site.

030 Tall Marsh

Typified by stands of *Typha* sp. and/or *Scirpus* sp. These areas are usually underwater and have generally fine, muddy soils with few rocks. This classification is predominant in the wetlands at the Site.

Open Water Subgroup

050 Ponds and Impoundments

054 Open Water

This classification was used for the ponds and other open water bodies on Site.

Emergent Subgroup

090 Mudflats

This classification represents areas that often become exposed between the high and low water marks along the pond margins. It also includes small pool areas that completely dry out during the summer. Vegetation is usually sparse, but may include such species as *Echinochloa crusgallii*, *Rumex* sp., *Polygonum* sp., or a few other grasses or sedges.

100 WOODLANDS HABITAT GROUP

110 Riparian Woodland

This classification is typified by stands of *Populus deltoides*, *Salix amygdaloides*, *Ulmus pumila*, *Populus albus*, and perhaps a few other tree species. There may also be an understory of *Prunus* sp., *Symphoricarpos* sp., *Salix* sp., or other woody species. This classification is found primarily along the drainage bottoms on Site.

120 Ponderosa Woodland

Typified by scattered stands of *Pinus ponderosa* with some occasional *Psuedotsuga menziesii*. This classification is found primarily on the western edge of the Site on the northern edges of ridgetops. It is also common along the old railroad grade. It is often surrounded by xeric mixed grassland.

130 Tree Plantings

This classification represent areas where trees have been planted for landscaping or shelterbelt purposes. The only location of this classification in the buffer zone in the apple orchard. Areas of this classification are present in the Industrial Area, but no vegetation mapping was done in this area for this map.

200 SHRUBLANDS HABITATS GROUP

210 Riparian Shrubland

This classification is composed of stands of *Salix exigua* and/or *Amorpha fruticosa*. It is found primarily along the stream channels at the Site. This classification was broken down into two other subdivisions dependent on which species was dominant.

211 Riparian Shrubland - Stands dominated by *Amorpha fruticosa*.

212 Riparian Shrubland - Stands dominated by *Salix exigua*.

220 Short Upland Shrubland

This classification is dominated by stands of *Symphoricarpos occidentalis* and occasionally *Rosa* sp. This classification is typically found in a wetter environment than the Savannah Shrubland habitat described below. The short upland shrub is often found in association with wet meadows and other aquatic/riparian/wetland classifications.

230 Tall Upland Shrubland

This classification is typified by stands of *Crataegus erythropoda*, *Prunus virginiana*, and *Prunus americana*. Most of this classification is found on north facing slopes in the Rock Creek drainage. It is typically underlain by cobbly, gravelly soils.

260 Savannah Shrubland

This classification represents areas of open shrubland with grassland between the scattered shrubs. The predominant shrub for this classification is *Rhus aromatica*, but occasionally *Ribes* ssp. and some other woody species may be present. Most of this classification is found in the Rock Creek drainage on Site.

300 GRASSLANDS HABITATS GROUP

310 Short Grassland

This classification is typified by stands short grass prairie species, *Buchloe dactyloides* and *Bouteloua gracilis*. Very little of this classification is found at the Site.

320 Mixed Grassland

This classification is broken down into three subdivisions found on the Site, which often intermix making boundary delineations difficult between the classification types.

322 Mesic Mixed Grassland

This classification is typified dominated by *Agropyron smithii*, *Poa pratensis*, and *Bouteloua gracilis*. Other common species include *Stipa viridula*, *Poa compressa*, *Bromus japonicus*, and *Alyssum minus*. These grasslands have more of a solid turf appearance due to the physiognomy of the species present. This is in contrast to the bunchgrass appearance of the xeric mixed grassland described below. The soils are considered to be clay loams and do not have the cobbly appearance at the surface that is typical of the xeric mixed grassland soils. Most of the hillsides on the Site are considered mesic mixed grassland. The quality of these grasslands varies considerably across the Site. The mesic mixed grasslands on the western side of the Site seem to have been less impacted and degraded by exotic, alien invaders such as *Bromus japonicus*, *Alyssum minus*, and *Carduus nutans*, than those on the eastern edge of the site. For classification purposes no distinctions were made based on the impact of these exotics. As long as an understory of *Agropyron smithii*, *Poa pratensis*, or *Bouteloua gracilis* was present beneath the exotic, alien species the grassland was still classified as mesic mixed grassland.

323 Xeric Mixed Grassland

This classification is dominated by *Andropogon gerardii*, *Andropogon scoparius*, *Stipa comata*, *Muhlenbergia montana*, *Carex heliophila*, *Arenaria fendleri*, *Aster porteri*, *Koleria pyramidalis*, and *Liatris punctata*. The grassland has a bunchgrass appearance due to the physiognomy of the species present. Stands of *Yucca glauca* which are found in a few spots primarily on ridgetops on the eastern side of the Site are also included in the xeric mixed grassland classification because they

are often surrounded and intermixed with this classification type. This classification is found on nearly all the pediments and ridgetops on Site and is underlain by Rocky Flats Alluvium. The soils are considered to be sandy clay loams with lots of cobbles. The surface of the ground is usually very rocky. Two subdivisions of xeric mixed grassland were recognized.

331 Xeric Tallgrass Prairie

This subdivision is dominated by *Andropogon gerardii* and *Andropogon scoparius*. It also contains high cover of *Muhlenbergia montana*, *Carex heliophila*, *Arenaria fendleri*, and *Aster porteri*. Other tallgrass prairie species include *Sorghastrum nutans*, *Sporobolus heterolepis*, and *Panicum virgatum*. The soils are usually visibly cobbly on the surface.

332 Xeric Needle and Thread Grass Prairie

This subdivision is dominated by *Stipa comata* and *Stipa neomexicana*. It contains very little *Andropogon gerardii* and *Andropogon scoparius*. The soils are not quite as visibly cobbly as the Xeric Tallgrass Prairie classification.

334 Reclaimed Mixed Grassland

This classification is dominated by *Bromus inermis*, *Agropyron intermedium*, *Agropyron cristatum*, *Melilotus* sp., *Convolvulus arvensis*, and other planted or adventive species. This classification covers all areas that have been previously been farmed or disturbed, and then revegetated with various seed mixtures. Large tracts of this habitat type are found in the southeastern portion of the Site and in and around the Industrial Area.

400 DISTURBANCE HABITAT GROUP

410 Annual Grass/Forb

This classification is dominated by a plant community of annuals such as *Bromus japonicus*, *Bromus tectorum*, *Centaurea diffusa*, *Helianthus annuus*, and other associated species. This category was used when little or no mesic mixed grassland community existed beneath the annual species listed above. These areas were often disturbed, unvegetated areas or areas where reclamation efforts had failed and an annual, early successional stage had established.

420 Disturbed /Barren Lands (Roads)

This classification was used for the roads and Industrial Area and other disturbed barren areas.

500 STRUCTURES AND STRUCTURE ASSOCIATIONS HABITATS GROUP

530 Rock and Gravel Piles

This classification was used for rip/rap piles along stream channels and on dam faces.

Table B-5. Wetland Indicator Codes and Meanings

Code	Meaning
Blank	No information listed on species in USFWS wetland list.
FACU	Facultative Upland (FACU). Usually occur in non-wetlands (estimated probability 67%-99%), but occasionally found in wetlands (estimated probability 1%-33%).
OBL	Obligate Wetland (OBL). Occur almost always (estimated probability >99%) under natural conditions in wetlands.
FACW	Facultative Wetland (FACW). Usually occur in wetlands (estimated probability 67%-99%), but occasionally found in non-wetlands.
NI	No indicator - not enough information to make a good determination.
FAC	Facultative (FAC). Equally likely to occur in wetlands or non-wetlands (estimated probability 34%-66%).
UPL	Obligate Upland (UPL). Occur in wetlands in another region, but occur almost always (estimated probability >99%) under natural conditions in non-wetlands in the region specified.
FACU-	Same as FACU above except the negative sign indicates a frequency toward the lower end of the category (less frequently found in wetlands).
FAC-	Same as FAC above except the negative sign indicates a frequency toward the lower end of the category (less frequently found in wetlands).

Appendix D

**Multi-Species Census
Survey Summaries**

Habitat use summary from winter season multi-species census surveys at Rocky Flats Environmental Technology Site in 1997.

Major Habitat Type	Taxonomic Group	Common Name	Species Code	Habitat Type	Number of Observations	Observations/Minute	Percent of Observations in Habitat	Mean Observations/min = 0.63
WET MEADOW					Total Number		Obs./min = 0.12	
Number of Species = 4					Observation Time = 33 min		Obs. = 4	
	Songbird	Song Sparrow	MEME2	10	1	0.030	25.00	
	Songbird	American Tree Sparrow	SPAR1	10	1	0.030	25.00	
	Songbird	European Starling	STVU1	10	1	0.030	25.00	
	Big Game	Mule Deer	ODHE1	10	1	0.030	25.00	
SHORT MARSH					Total Number		Obs./min = 0.16	
Number of Species = 9					Observation Time = 127 min		Obs. = 20	
	Carnivore	Coyote	CALA1	20	8	0.063	40.00	
	Songbird	Black-billed Magpie	PIPI1	20	3	0.024	15.00	
	Songbird	Common Raven	COCO1	20	2	0.016	10.00	
	Songbird	American Tree Sparrow	SPAR1	20	2	0.016	10.00	
	Songbird	Northern Flicker	COAU1	20	1	0.008	5.00	
	Songbird	Horned Lark	ERAL1	20	1	0.008	5.00	
	Songbird	Western Meadowlark	STNE1	20	1	0.008	5.00	
	Raptor	American Kestrel	FASP1	20	1	0.008	5.00	
	Waterfowl	Common Snipe	GAGA1	20	1	0.008	5.00	
TALL MARSH					Total Number		Obs./min = 0.10	
Number of Species = 4					Observation Time = 48 min		Obs. = 5	
	Waterfowl	Green-winged Teal	ANCR1	30	2	0.042	40.00	
	Songbird	Red-winged Blackbird	AGPH1	30	1	0.021	20.00	
	Songbird	Song Sparrow	MEME2	30	1	0.021	20.00	
	Songbird	Black-billed Magpie	PIPI1	30	1	0.021	20.00	
IMPOUNDMENTS					Total Number		Obs./min = 1.56	
Number of Species = 6					Observation Time = 62 min		Obs. = 97	
	Waterfowl	Redhead	AYAM1	54	54	0.871	55.67	
	Waterfowl	Mallard	ANPL1	54	17	0.274	17.53	
	Waterfowl	Green-winged Teal	ANCR1	54	15	0.242	15.46	
	Waterfowl	Common Goldeneye	BUCL1	54	9	0.145	9.28	
	Carnivore	Coyote	CALA1	54	1	0.016	1.03	
	Waterfowl	Bufflehead	BUAL1	54	1	0.016	1.03	

Habitat use summary from winter season multi-species census surveys at Rocky Flats Environmental Technology Site in 1997.

Major Habitat Type	Taxonomic Group	Common Name	Species Code	Habitat Type	Number of Observations	Observations/Minute	Percent of Observations in Habitat	Mean Observations/min = 0.63
RIPARIAN WOODLAND COMPLEX					Total Number		Obs./min = 0.63	
Number of Species = 16					Observation Time = 310 min		Obs. = 194	
	Songbird	European Starling	STVU1	110	51	0.165	26.29	
	Songbird	American Tree Sparrow	SPAR1	110	43	0.139	22.16	
	Songbird	Black-capped Chickadee	PAAT1	110	28	0.090	14.43	
	Songbird	Black-billed Magpie	PIPI1	110	21	0.068	10.82	
	Songbird	Northern Flicker	COAU1	110	16	0.052	8.25	
	Raptor	Great Horned Owl	BUVI1	110	14	0.045	7.22	
	Big Game	Mule Deer	ODHE1	110	5	0.016	2.58	
	Songbird	Common Raven	COCO1	110	4	0.013	2.06	
	Songbird	Song Sparrow	MEME2	110	3	0.010	1.55	
	Songbird	Horned Lark	ERAL1	110	2	0.006	1.03	
	Carnivore	Coyote	CALA1	110	2	0.006	1.03	
	Songbird	House Finch	CAME2	110	1	0.003	0.52	
	Songbird	Downy Woodpecker	PIPU1	110	1	0.003	0.52	
	Songbird	American Robin	TUMI1	110	1	0.003	0.52	
	Raptor	American Kestrel	FASP1	110	1	0.003	0.52	
	Raptor	Bald Eagle	HALE1	110	1	0.003	0.52	
RIPARIAN SHRUBLAND - AMORPHA					Total Number		Obs./min = 0.08	
Number of Species = 2					Observation Time = 39 min		Obs. = 3	
	Songbird	Western Meadowlark	STNE1	211	2	0.051	66.67	
	Carnivore	Coyote	CALA1	211	1	0.026	33.33	
RIPARIAN SHRUBLAND - SALIX					Total Number		Obs./min = 1.44	
Number of Species = 7					Observation Time = 73 min		Obs. = 105	
	Songbird	European Starling	STVU1	212	97	1.329	92.38	
	Songbird	Horned Lark	ERAL1	212	2	0.027	1.90	
	Songbird	American Tree Sparrow	SPAR1	212	2	0.027	1.90	
	Songbird	Northern Flicker	COAU1	212	1	0.014	0.95	
	Songbird	Song Sparrow	MEME2	212	1	0.014	0.95	
	Songbird	Black-billed Magpie	PIPI1	212	1	0.014	0.95	
	Raptor	Great Horned Owl	BUVI1	212	1	0.014	0.95	

Habitat use summary from winter season multi-species census surveys at Rocky Flats Environmental Technology Site in 1997.

Major Habitat Type	Taxonomic Group	Common Name	Species Code	Habitat Type	Number of Observations	Observations/Minute	Percent of Observations in Habitat	Mean Observations/min = 0.63
TALL UPLAND SHRUBLAND						Total Number	Obs./min = 0.63	
Number of Species = 10						Obs. = 98	Observation Time = 156 min	
	Songbird	American Robin	TUMI1	230	39	0.250	39.80	
	Songbird	Black-billed Magpie	PIPI1	230	18	0.115	18.37	
	Big Game	Mule Deer	ODHE1	230	18	0.115	18.37	
	Songbird	Black-capped Chickadee	PAAT1	230	5	0.032	5.10	
	Songbird	American Tree Sparrow	SPAR1	230	5	0.032	5.10	
	Carnivore	Coyote	CALA1	230	5	0.032	5.10	
	Songbird	European Starling	STVU1	230	3	0.019	3.06	
	Songbird	Northern Flicker	COAU1	230	2	0.013	2.04	
	Songbird	Song Sparrow	MEME2	230	2	0.013	2.04	
	Songbird	Common Raven	COCO1	230	1	0.006	1.02	
MESIC MIXED GRASSLAND						Total Number	Obs./min = 1.74	
Number of Species = 5						Obs. = 150	Observation Time = 86 min	
	Big Game	Mule Deer	ODHE1	322	141	1.640	94.00	
	Songbird	American Robin	TUMI1	322	4	0.047	2.67	
	Songbird	Horned Lark	ERAL1	322	3	0.035	2.00	
	Songbird	European Starling	STVU1	322	1	0.012	0.67	
	Raptor	Rough-legged Hawk	BULA1	322	1	0.012	0.67	
XERIC MIXED GRASSLAND						Total Number	Obs./min = 0.17	
Number of Species = 4						Obs. = 25	Observation Time = 149 min	
	Songbird	Horned Lark	ERAL1	323	20	0.134	80.00	
	Songbird	Snow Bunting	PLNI1	323	2	0.013	8.00	
	Carnivore	Coyote	CALA1	323	2	0.013	8.00	
	Big Game	Mule Deer	ODHE1	323	1	0.007	4.00	

Habitat use summary from winter season multi-species census surveys at Rocky Flats Environmental Technology Site in 1997.

Major Habitat Type	Taxonomic Group	Common Name	Species Code	Habitat Type	Number of Observations	Observations/Minute	Percent of Observations in Habitat	Mean Observations/min = 0.63
RECLAIMED GRASSLAND					Total Number		Obs./min = 0.63	
Number of Species = 1					Observation Time = 16 min		Obs. = 10	
	Big Game	Mule Deer	ODHE1	324	10	0.625	100.00	
DISTURBED AND STRUCTURES					Total Number		Obs./min = 0.31	
Number of Species = 2					Observation Time = 13 min		Obs. = 4	
		None	NA	410	0	0.000	0.00	
	Lagomorph	Desert Cottontail	SYAU1	420	2	0.154	50.00	
	Songbird	American Tree Sparrow	SPAR1	540	2	0.154	50.00	

Habitat use summary from spring season multi-species census surveys at Rocky Flats Environmental Technology Site in 1997.

Major Habitat Type	Taxonomic Group	Common Name	Species Code	Habitat Type	Number of Observations	Observations/Minute	Percent of Observations in Habitat	Mean Observations/ min = 2.85
WET MEADOW					Total Number		Obs./min = 0.56	
Number of Species = 4					Observation Time = 9 min		Obs. = 5	
	Songbird	House Finch	CAME2	10	2	0.222	40.00	
	Songbird	Black-billed Magpie	PIPI1	10	1	0.111	20.00	
	Songbird	Western Meadowlark	STNE1	10	1	0.111	20.00	
	Songbird	Mourning Dove	ZEMA1	10	1	0.111	20.00	
SHORT MARSH					Total Number		Obs./min = 1.02	
Number of Species = 17					Observation Time = 172 min		Obs. = 175	
	Songbird	Red-winged Blackbird	AGPH1	20	86	0.500	49.14	
	Songbird	Western Meadowlark	STNE1	20	20	0.116	11.43	
	Songbird	Cliff Swallow	HIPY1	20	11	0.064	6.29	
	Songbird	Vesper Sparrow	POGR1	20	11	0.064	6.29	
	Songbird	Grasshopper Sparrow	AMSA1	20	9	0.052	5.14	
	Waterfowl	Common Snipe	GAGA1	20	8	0.047	4.57	
	Songbird	Common Yellowthroat	GETR1	20	6	0.035	3.43	
	Songbird	Song Sparrow	MEME2	20	4	0.023	2.29	
	Songbird	Mourning Dove	ZEMA1	20	4	0.023	2.29	
	Herptile	Boreal Chorus Frog	PSTR1	20	4	0.023	2.29	
	Songbird	Black-billed Magpie	PIPI1	20	3	0.017	1.71	
	Songbird	House Finch	CAME2	20	2	0.012	1.14	
	Songbird	American Goldfinch	CATR1	20	2	0.012	1.14	
	Waterfowl	Mallard	ANPL1	20	2	0.012	1.14	
	Songbird	Northern Oriole	ICGA1	20	1	0.006	0.57	
	Songbird	European Starling	STVU1	20	1	0.006	0.57	
	Carnivore	Coyote	CALA1	20	1	0.006	0.57	
TALL MARSH					Total Number		Obs./min = 3.90	
Number of Species = 23					Observation Time = 99 min		Obs. = 386	
	Songbird	Cliff Swallow	HIPY1	30	114	1.152	29.53	
	Songbird	Red-winged Blackbird	AGPH1	30	71	0.717	18.39	
	Songbird	Barn Swallow	HIRU1	30	67	0.677	17.36	
	Songbird	Violet-green Swallow	TATH1	30	27	0.273	6.99	

Habitat use summary from spring season multi-species census surveys at Rocky Flats Environmental Technology Site in 1997.

Major Habitat Type	Taxonomic Group	Common Name	Species Code	Habitat Type	Number of Observations	Observations/ Minute	Percent of Observations in Habitat	Mean Observations/ min = 2.85
	Songbird	Yellow-headed Blackbird	XAXA1	30	21	0.212	5.44	
	Songbird	Song Sparrow	MEME2	30	20	0.202	5.18	
	Songbird	European Starling	STVU1	30	13	0.131	3.37	
	Songbird	Tree Swallow	TABI1	30	10	0.101	2.59	
	Waterfowl	Common Snipe	GAGA1	30	8	0.081	2.07	
	Songbird	Western Meadowlark	STNE1	30	7	0.071	1.81	
	Herptile	Boreal Chorus Frog	PSTR1	30	6	0.061	1.55	
	Songbird	Common Yellowthroat	GETR1	30	5	0.051	1.30	
	Raptor	American Kestrel	FASP1	30	3	0.030	0.78	
	Waterfowl	American Coot	FUAM1	30	3	0.030	0.78	
	Songbird	Brown-headed Cowbird	MOAT1	30	2	0.020	0.52	
	Songbird	Mourning Dove	ZEMA1	30	2	0.020	0.52	
	Songbird	Black-billed Magpie	PIPI1	30	1	0.010	0.26	
	Songbird	Vesper Sparrow	POGR1	30	1	0.010	0.26	
	Songbird	White-crowned Sparrow	ZOLE1	30	1	0.010	0.26	
	Carnivore	Coyote	CALA1	30	1	0.010	0.26	
	Herptile	Western Painted Turtle	CHPI1	30	1	0.010	0.26	
	Waterfowl	Mallard	ANPL1	30	1	0.010	0.26	
	Waterfowl	Great Blue Heron	ARHE1	30	1	0.010	0.26	
NATURAL PONDS AND POOLS					Total Number		Obs./min = 3.09	
Number of Species = 25					Observation Time = 1.1 min		Obs. = 34	
	Herptile	Boreal Chorus Frog	PSTR1	43	24	2.182	88.89	
	Waterfowl	Mallard	ANPL1	43	2	0.182	7.41	
	Waterfowl	Common Snipe	GAGA1	43	1	0.091	3.70	
	Waterfowl	Mallard	ANPL1	46	2	0.182	100.00	
	Herptile	Boreal Chorus Frog	PSTR1	51	5	0.455	100.00	
IMPOUNDMENTS					Total Number		Obs./min = 4.92	
Number of Species = 26					Observation Time = 148 min		Obs. = 728	
	Waterfowl	Mallard	ANPL1	54	122	0.824	16.76	
	Waterfowl	Green-winged Teal	ANCR1	54	92	0.622	12.64	
	Songbird	Cliff Swallow	HIPY1	54	85	0.574	11.68	

Habitat use summary from spring season multi-species census surveys at Rocky Flats Environmental Technology Site in 1997.

Major Habitat Type	Taxonomic Group	Common Name	Species Code	Habitat Type	Number of Observations	Observations/ Minute	Percent of Observations in Habitat	Mean Observations/ min = 2.85
	Herptile	Boreal Chorus Frog	PSTR1	54	83	0.561	11.40	
	Waterfowl	Gadwall	ANST1	54	56	0.378	7.69	
	Waterfowl	American Coot	FUAM1	54	40	0.270	5.49	
	Waterfowl	Bufflehead	BUAL1	54	37	0.250	5.08	
	Waterfowl	Greater Scaup	AYMA1	54	33	0.223	4.53	
	Waterfowl	Common Merganser	MEME1	54	32	0.216	4.40	
	Waterfowl	Ring-necked Duck	AYCO1	54	26	0.176	3.57	
	Waterfowl	Cinnamon Teal	ANCY1	54	17	0.115	2.34	
	Waterfowl	Lesser Scaup	AYAF1	54	16	0.108	2.20	
	Songbird	Red-winged Blackbird	AGPH1	54	14	0.095	1.92	
	Waterfowl	Redhead	AYAM1	54	14	0.095	1.92	
	Waterfowl	Pied-billed Grebe	POPO1	54	14	0.095	1.92	
	Waterfowl	Blue-winged Teal	ANDI1	54	12	0.081	1.65	
	Waterfowl	Ruddy Duck	OXJA1	54	7	0.047	0.96	
	Waterfowl	Canada Goose	BRCA1	54	6	0.041	0.82	
	Waterfowl	Greater Yellowlegs	TRME1	54	6	0.041	0.82	
	Waterfowl	Great Blue Heron	ARHE1	54	5	0.034	0.69	
	Waterfowl	Double-crested Cormorant	PHAU1	54	3	0.020	0.41	
	Herptile	Western Painted Turtle	CHPI1	54	2	0.014	0.27	
	Waterfowl	Wilson's Phalarope	PHTR1	54	2	0.014	0.27	
	Waterfowl	Eared Grebe	PONI1	54	2	0.014	0.27	
	Songbird	Western Meadowlark	STNE1	54	1	0.007	0.14	
	Large Rodent	Muskrat	ONZI1	54	1	0.007	0.14	
MUDFLATS					Total Number		Obs./min = 2.16	
Number of Species = 10					Total Observation Time = 25 min		Obs. = 54	
	Waterfowl	Killdeer	CHVO1	93	31	1.240	57.41	
	Songbird	Brewer's Blackbird	EUCY1	93	5	0.200	9.26	
	Songbird	Cliff Swallow	HIPY1	93	5	0.200	9.26	
	Waterfowl	Spotted Sandpiper	ACMA1	93	4	0.160	5.56	
	Songbird	Red-winged Blackbird	AGPH1	93	3	0.120	5.56	
	Songbird	Western Meadowlark	STNE1	93	2	0.080	7.41	

Habitat use summary from spring season multi-species census surveys at Rocky Flats Environmental Technology Site in 1997.

Major Habitat Type	Taxonomic Group	Common Name	Species Code	Habitat Type	Number of Observations	Observations/ Minute	Percent of Observations in Habitat	Mean Observations/ min = 2.85
	Songbird	European Starling	STVU1	93	2	0.080	3.70	
	Waterfowl	Canada Goose	BRCA1	93	1	0.040	1.85	
	Waterfowl	Greater Yellowlegs	TRME1	93	1	0.040	1.85	
RIPARIAN WOODLAND COMPLEX					Total Number		Obs./min = 1.57	
Number of Species = 45					Observation Time = 411 min		Obs. = 645	
	Songbird	Western Meadowlark	STNE1	110	81	0.197	12.56	
	Songbird	House Finch	CAME2	110	71	0.173	11.01	
	Songbird	European Starling	STVU1	110	65	0.158	10.08	
	Songbird	American Goldfinch	CATR1	110	45	0.109	6.98	
	Songbird	Song Sparrow	MEME2	110	39	0.095	6.05	
	Songbird	American Robin	TUMI1	110	35	0.085	5.43	
	Songbird	Northern Oriole	ICGA1	110	30	0.073	4.65	
	Big Game	Mule Deer	ODHE1	110	29	0.071	4.50	
	Songbird	Mourning Dove	ZEMA1	110	28	0.068	4.34	
	Songbird	Red-winged Blackbird	AGPH1	110	27	0.066	4.19	
	Songbird	White-crowned Sparrow	ZOLE1	110	18	0.044	2.79	
	Songbird	Black-billed Magpie	PIPI1	110	17	0.041	2.64	
	Songbird	Yellow-rumped Warbler	DECO1	110	16	0.039	2.48	
	Songbird	Yellow Warbler	DEPE1	110	16	0.039	2.48	
	Songbird	Vesper Sparrow	POGR1	110	13	0.032	2.02	
	Raptor	Great Horned Owl	BUVI1	110	12	0.029	1.86	
	Songbird	Dark-eyed Junco	JUHY1	110	10	0.024	1.55	
	Songbird	Northern Flicker	COAU1	110	9	0.022	1.40	
	Songbird	Brown-headed Cowbird	MOAT1	110	9	0.022	1.40	
	Songbird	Lincoln's Sparrow	MELI1	110	8	0.019	1.24	
	Songbird	Mountain Bluebird	SICU1	110	8	0.019	1.24	
	Songbird	Western Kingbird	TYVE1	110	8	0.019	1.24	
	Herptile	Boreal Chorus Frog	PSTR1	110	7	0.017	1.09	
	Songbird	Barn Swallow	HIRU1	110	6	0.015	0.93	
	Songbird	Black-capped Chickadee	PAAT1	110	5	0.012	0.78	
	Songbird	Lesser Goldfinch	CAPS1	110	3	0.007	0.47	

Habitat use summary from spring season multi-species census surveys at Rocky Flats Environmental Technology Site in 1997.

Major Habitat Type	Taxonomic Group	Common Name	Species Code	Habitat Type	Number of Observations	Observations/ Minute	Percent of Observations in Habitat	Mean Observations/ min = 2.85
	Songbird	Brewer's Blackbird	EUCY1	110	3	0.007	0.47	
	Songbird	Common Yellowthroat	GETR1	110	3	0.007	0.47	
	Songbird	Blue Grosbeak	GUCA1	110	3	0.007	0.47	
	Songbird	Grasshopper Sparrow	AMSA1	110	2	0.005	0.31	
	Songbird	Lark Bunting	CAME3	110	2	0.005	0.31	
	Songbird	Western Wood-Pewee	COSO1	110	2	0.005	0.31	
	Raptor	Red-tailed Hawk	BUJA1	110	2	0.005	0.31	
	Raptor	Swainson's Hawk	BUSW1	110	2	0.005	0.31	
	Songbird	Common Raven	COCO1	110	1	0.002	0.16	
	Songbird	Gray Catbird	DUCA1	110	1	0.002	0.16	
	Songbird	Cliff Swallow	HIPY1	110	1	0.002	0.16	
	Songbird	Green-tailed Towhee	PICH1	110	1	0.002	0.16	
	Songbird	Common Grackle	QUQU1	110	1	0.002	0.16	
	Songbird	Say's Phoebe	SASA1	110	1	0.002	0.16	
	Songbird	Red-winged Blackbird	AGPH1	110	1	0.002	0.16	
	Raptor	Long-eared Owl	ASOT1	110	1	0.002	0.16	
	Waterfowl	Great Blue Heron	ARHE1	110	1	0.002	0.16	
	Waterfowl	Killdeer	CHVO1	110	1	0.002	0.16	
	Waterfowl	Common Snipe	GAGA1	110	1	0.002	0.16	
RIPARIAN SHRUBLAND - AMORPHA						Total Number	Obs./min = 0.23	
Number of Species = 3					Observation Time = 22 min	Obs. = 5		
	Songbird	Common Yellowthroat	GETR1	211	2	0.091	40.00	
	Songbird	Vesper Sparrow	POGR1	211	2	0.091	40.00	
	Songbird	Blue Grosbeak	GUCA1	211	1	0.045	20.00	
RIPARIAN SHRUBLAND - SALIX						Total Number	Obs./min = 2.43	
Number of Species = 21					Observation Time = 135 min	Obs. = 148		
	Songbird	Red-winged Blackbird	AGPH1	212	43	0.319	29.05	
	Songbird	European Starling	STVU1	212	32	0.237	21.62	
	Songbird	Western Meadowlark	STNE1	212	12	0.089	8.11	
	Songbird	Cliff Swallow	HIPY1	212	9	0.067	6.08	
	Songbird	Mourning Dove	ZEMA1	212	9	0.067	6.08	

Habitat use summary from spring season multi-species census surveys at Rocky Flats Environmental Technology Site in 1997.

Major Habitat Type	Taxonomic Group	Common Name	Species Code	Habitat Type	Number of Observations	Observations/ Minute	Percent of Observations in Habitat	Mean Observations/ min = 2.85
	Songbird	Barn Swallow	HIRU1	212	7	0.052	4.73	
	Waterfowl	Mallard	ANPL1	212	7	0.052	4.73	
	Songbird	House Finch	CAME2	212	6	0.044	4.05	
	Songbird	Song Sparrow	MEME2	212	6	0.044	4.05	
	Songbird	Yellow Warbler	DEPE1	212	3	0.022	2.03	
	Songbird	American Robin	TUMI1	212	3	0.022	2.03	
	Songbird	American Goldfinch	CATR1	212	2	0.015	1.35	
	Songbird	Grasshopper Sparrow	AMSA1	212	1	0.007	0.68	
	Songbird	Common Yellowthroat	GETR1	212	1	0.007	0.68	
	Songbird	Brown-headed Cowbird	MOAT1	212	1	0.007	0.68	
	Songbird	Vesper Sparrow	POGR1	212	1	0.007	0.68	
	Songbird	Say's Phoebe	SASA1	212	1	0.007	0.68	
	Songbird	Yellow-headed Blackbird	XAXA1	212	1	0.007	0.68	
	Carnivore	Coyote	CALA1	212	1	0.007	0.68	
	Raptor	American Kestrel	FASP1	212	1	0.007	0.68	
	Waterfowl	Common Snipe	GAGA1	212	1	0.007	0.68	
TALL UPLAND SHRUBLAND					Total Number		Obs/min = 1.18	
Number of Species = 32					Observation Time = 208 min		Obs. = 246	
	Big Game	Mule Deer	ODHE1	230	39	0.188	15.85	
	Songbird	Song Sparrow	MEME2	230	27	0.130	10.98	
	Songbird	Western Meadowlark	STNE1	230	25	0.120	10.16	
	Songbird	Rufous-sided Towhee	PIER1	230	24	0.115	9.76	
	Songbird	American Goldfinch	CATR1	230	17	0.082	6.91	
	Songbird	Red-winged Blackbird	AGPH1	230	14	0.067	5.69	
	Songbird	American Robin	TUMI1	230	13	0.063	5.28	
	Songbird	Black-billed Magpie	PIPI1	230	10	0.048	4.07	
	Songbird	House Finch	CAME2	230	7	0.034	2.85	
	Songbird	Northern Oriole	ICGA1	230	7	0.034	2.85	
	Songbird	Brown-headed Cowbird	MOAT1	230	7	0.034	2.85	
	Songbird	Yellow-rumped Warbler	DECO1	230	6	0.029	2.44	
	Songbird	Yellow-breasted Chat	ICVI1	230	6	0.029	2.44	

Habitat use summary from spring season multi-species census surveys at Rocky Flats Environmental Technology Site in 1997.

Major Habitat Type	Taxonomic Group	Common Name	Species Code	Habitat Type	Number of Observations	Observations/ Minute	Percent of Observations in Habitat	Mean Observations/ min = 2.85
	Songbird	Yellow Warbler	DEPE1	230	5	0.024	2.03	
	Songbird	Mourning Dove	ZEMA1	230	5	0.024	2.03	
	Songbird	Black-capped Chickadee	PAAT1	230	4	0.019	1.63	
	Songbird	Green-tailed Towhee	PICH1	230	4	0.019	1.63	
	Songbird	Vesper Sparrow	POGR1	230	3	0.014	1.22	
	Raptor	Great Horned Owl	BUVI1	230	3	0.014	1.22	
	Songbird	Common Raven	COCO1	230	2	0.010	0.81	
	Songbird	Common Yellowthroat	GETR1	230	2	0.010	0.81	
	Songbird	Cliff Swallow	HIPY1	230	2	0.010	0.81	
	Songbird	Dark-eyed Junco	JUHY1	230	2	0.010	0.81	
	Songbird	Violet-green Swallow	TATH1	230	2	0.010	0.81	
	Songbird	White-crowned Sparrow	ZOLE1	230	2	0.010	0.81	
	Waterfowl	Mallard	ANPL1	230	2	0.010	0.81	
	Songbird	Western Wood-Pewee	COSO1	230	1	0.005	0.41	
	Songbird	Eastern Phoebe	SAPH1	230	1	0.005	0.41	
	Songbird	Yellow-headed Blackbird	XAXA1	230	1	0.005	0.41	
	Carnivore	Coyote	CALA1	230	1	0.005	0.41	
	Raptor	Red-tailed Hawk	BUJA1	230	1	0.005	0.41	
	Waterfowl	Common Snipe	GAGA1	230	1	0.005	0.41	
MESIC MIXED GRASSLAND					Total Number		Obs./min = 1.87	
Number of Species = 17					Observation Time = 79 min		Obs. = 148	
	Big Game	Mule Deer	ODHE1	322	72	0.911	48.65	
	Songbird	Western Meadowlark	STNE1	322	30	0.380	20.27	
	Songbird	Vesper Sparrow	POGR1	322	8	0.101	5.41	
	Songbird	Western Kingbird	TYVE1	322	6	0.076	4.05	
	Songbird	House Finch	CAME2	322	4	0.051	2.70	
	Raptor	Red-tailed Hawk	BUJA1	322	4	0.051	2.70	
	Waterfowl	Canada Goose	BRCA1	322	4	0.051	2.70	
	Songbird	Red-winged Blackbird	AGPH1	322	3	0.038	2.03	
	Songbird	Mountain Bluebird	SICU1	322	3	0.038	2.03	
	Songbird	Lark Bunting	CAME3	322	2	0.025	1.35	

Habitat use summary from spring season multi-species census surveys at Rocky Flats Environmental Technology Site in 1997.

Major Habitat Type	Taxonomic Group	Common Name	Species Code	Habitat Type	Number of Observations	Observations/ Minute	Percent of Observations in Habitat	Mean Observations/ min = 2.85
	Songbird	American Goldfinch	CATR1	322	2	0.025	1.35	
	Songbird	Common Raven	COCO1	322	2	0.025	1.35	
	Songbird	Cliff Swallow	HIPY1	322	2	0.025	1.35	
	Songbird	Townsend's Solitaire	MYTO1	322	2	0.025	1.35	
	Songbird	European Starling	STVU1	322	2	0.025	1.35	
	Songbird	Barn Swallow	HIRU1	322	1	0.013	0.68	
	Waterfowl	Double-crested Cormorant	PHAU1	322	1	0.013	0.68	
XERIC MIXED GRASSLAND					Total Number		Obs./min = 0.62	
Number of Species = 8					Observation Time = 186 min		Obs. = 115	
	Songbird	Western Meadowlark	STNE1	323	44	0.237	38.26	
	Big Game	Mule Deer	ODHE1	323	37	0.199	32.17	
	Songbird	Vesper Sparrow	POGR1	323	28	0.151	24.35	
	Carnivore	Coyote	CALA1	323	4	0.022	3.48	
	Songbird	Grasshopper Sparrow	AMSA1	323	2	0.011	1.74	
	Big Game	White-tailed Deer	ODVI1	323	2	0.011	1.74	
	Songbird	Barn Swallow	HIRU1	323	1	0.005	0.87	
	Songbird	Black-billed Magpie	PIPI1	323	1	0.005	0.87	
RECLAIMED GRASSLAND					Total Number		Obs./min = 2.49	
Number of Species = 11					Observation Time = 35 min		Obs. = 87	
	Songbird	House Finch	CAME2	324	26	0.743	29.89	
	Songbird	Cliff Swallow	HIPY1	324	23	0.657	26.44	
	Songbird	Western Meadowlark	STNE1	324	11	0.314	12.64	
	Songbird	Vesper Sparrow	POGR1	324	7	0.200	8.05	
	Songbird	Grasshopper Sparrow	AMSA1	324	6	0.171	6.90	
	Songbird	European Starling	STVU1	324	6	0.171	6.90	
	Waterfowl	Killdeer	CHVO1	324	3	0.086	3.45	
	Songbird	Red-winged Blackbird	AGPH1	324	2	0.057	2.30	
	Songbird	Say's Phoebe	SASA1	324	1	0.029	1.15	
	Songbird	Mountain Bluebird	SICU1	324	1	0.029	1.15	
	Songbird	Mourning Dove	ZEMA1	324	1	0.029	1.15	

Habitat use summary from spring season multi-species census surveys at Rocky Flats Environmental Technology Site in 1997.

Major Habitat Type	Taxonomic Group	Common Name	Species Code	Habitat Type	Number of Observations	Observations/ Minute	Percent of Observations in Habitat	Mean Observations/ min = 2.85
DISTURBED AND STRUCTURES						Total Number	Obs./min = 15.18	
Number of Species = 4			Observation Time = 11 min		Obs. = 167			
	Lagomorph	Desert Cottontail	SYAU1	410	2	0.182	100.00	
		None	NA	420	0	0.000	0.00	
	Lagomorph	Desert Cottontail	SYAU1	530	2	0.182	100.00	
	Songbird	Cliff Swallow	HIPY1	540	158	14.364	96.93	
	Songbird	Red-winged Blackbird	AGPH1	540	3	0.273	1.84	
	Songbird	Brown-headed Cowbird	MOAT1	540	1	0.091	0.61	
	Lagomorph	Desert Cottontail	SYAU1	540	1	0.091	0.61	

Habitat use summary from summer season multi-species census surveys at Rocky Flats Environmental Technology Site in 1997.

Major Habitat Type	Taxonomic Group	Common Name	Species Code	Habitat Type	Number of Observations	Observations/Minute	Percent of Observations in Habitat	Mean Observations/min = 2.95
WET MEADOW					Total Number		Obs./min = 1.23	
Number of Species = 17					Observation Time = 70 min		Obs. = 86	
	Songbird	Red-winged Blackbird	AGPH1	10	22	0.314	25.58	
	Songbird	House Finch	CAME2	10	18	0.257	20.93	
	Songbird	Vesper Sparrow	POGR1	10	15	0.214	17.44	
	Songbird	Western Meadowlark	STNE1	10	10	0.143	11.63	
	Songbird	Grasshopper Sparrow	AMSA1	10	6	0.086	6.98	
	Songbird	Lesser Goldfinch	CAPS1	10	2	0.029	2.33	
	Songbird	American Goldfinch	CATR1	10	2	0.029	2.33	
	Songbird	European Starling	STVU1	10	2	0.029	2.33	
	Songbird	Cliff Swallow	HIPY1	10	1	0.014	1.16	
	Songbird	Barn Swallow	HIRU1	10	1	0.014	1.16	
	Songbird	Song Sparrow	MEME2	10	1	0.014	1.16	
	Songbird	Black-billed Magpie	PIPI1	10	1	0.014	1.16	
	Songbird	Mourning Dove	ZEMA1	10	1	0.014	1.16	
	Big Game	Mule Deer	ODHE1	10	1	0.014	1.16	
	Raptor	Swainson's Hawk	BUSW1	10	1	0.014	1.16	
	Raptor	American Kestrel	FASP1	10	1	0.014	1.16	
	Waterfowl	Double-crested Cormorant	PHAU1	10	1	0.014	1.16	
SHORT MARSH					Total Number		Obs./min = 0.81	
Number of Species = 19					Observation Time = 80 min		Obs. = 145	
	Songbird	Red-winged Blackbird	AGPH1	20	41	0.513	28.28	
	Songbird	Brewer's Blackbird	EUCY1	20	21	0.263	14.48	
	Songbird	Western Meadowlark	STNE1	20	17	0.213	11.72	
	Songbird	Vesper Sparrow	POGR1	20	11	0.138	7.59	
	Songbird	House Finch	CAME2	20	10	0.125	6.90	
	Songbird	Barn Swallow	HIRU1	20	7	0.088	4.83	
	Songbird	European Starling	STVU1	20	7	0.088	4.83	
	Songbird	Song Sparrow	MEME2	20	5	0.063	3.45	
	Songbird	Blue Grosbeak	GUCA1	20	4	0.050	2.76	
	Songbird	American Robin	TUMI1	20	4	0.050	2.76	

Habitat use summary from summer season multi-species census surveys at Rocky Flats Environmental Technology Site in 1997.

Major Habitat Type	Taxonomic Group	Common Name	Species Code	Habitat Type	Number of Observations	Observations/Minute	Percent of Observations in Habitat	Mean Observations/min = 2.95
	Waterfowl	Common Snipe	GAGA1	20	4	0.050	2.76	
	Songbird	Mourning Dove	ZEMA1	20	3	0.038	2.07	
	Songbird	Grasshopper Sparrow	AMSA1	20	2	0.025	1.38	
	Songbird	American Goldfinch	CATR1	20	2	0.025	1.38	
	Songbird	Cliff Swallow	HIPY1	20	2	0.025	1.38	
	Big Game	Mule Deer	ODHE1	20	2	0.025	1.38	
	Songbird	Common Yellowthroat	GETR1	20	1	0.013	0.69	
	Songbird	Say's Phoebe	SASA1	20	1	0.013	0.69	
	Songbird	Western Kingbird	TYVE1	20	1	0.013	0.69	
TALL MARSH					Total Number		Obs./min = 3.99	
Number of Species = 27					Observation Time = 127 min		Obs. = 507	
	Songbird	Red-winged Blackbird	AGPH1	30	250	1.969	49.31	
	Songbird	Yellow-headed Blackbird	XAXA1	30	59	0.465	11.64	
	Songbird	Barn Swallow	HIRU1	30	49	0.386	9.66	
	Songbird	Brewer's Blackbird	EUCY1	30	35	0.276	6.90	
	Songbird	Song Sparrow	MEME2	30	19	0.150	3.75	
	Songbird	House Finch	CAME2	30	15	0.118	2.96	
	Songbird	Common Yellowthroat	GETR1	30	15	0.118	2.96	
	Songbird	Vesper Sparrow	POGR1	30	10	0.079	1.97	
	Songbird	European Starling	STVU1	30	10	0.079	1.97	
	Songbird	Grasshopper Sparrow	AMSA1	30	9	0.071	1.78	
	Big Game	Mule Deer	ODHE1	30	7	0.055	1.38	
	Songbird	Western Meadowlark	STNE1	30	4	0.031	0.79	
	Songbird	Mourning Dove	ZEMA1	30	4	0.031	0.79	
	Songbird	American Goldfinch	CATR1	30	3	0.024	0.59	
	Songbird	Cliff Swallow	HIPY1	30	3	0.024	0.59	
	Herptile	Western Painted Turtle	CHPI1	30	2	0.016	0.39	
	Waterfowl	Mallard	ANPL1	30	2	0.016	0.39	
	Waterfowl	Common Snipe	GAGA1	30	2	0.016	0.39	
	Songbird	Lesser Goldfinch	CAPS1	30	1	0.008	0.20	
	Songbird	Northern Oriole	ICGA1	30	1	0.008	0.20	

Habitat use summary from summer season multi-species census surveys at Rocky Flats Environmental Technology Site in 1997.

Major Habitat Type	Taxonomic Group	Common Name	Species Code	Habitat Type	Number of Observations	Observations/Minute	Percent of Observations in Habitat	Mean Observations/min = 2.95
	Songbird	Say's Phoebe	SASA1	30	1	0.008	0.20	
	Songbird	House Wren	TRAE1	30	1	0.008	0.20	
	Songbird	Wilson's Warbler	WIPU1	30	1	0.008	0.20	
	Herptile	Tiger Salamander	AMT11	30	1	0.008	0.20	
	Herptile	Prairie Rattlesnake	CRV11	30	1	0.008	0.20	
	Raptor	Swainson's Hawk	BUSW1	30	1	0.008	0.20	
	Raptor	Turkey Vulture	CAAU1	30	1	0.008	0.20	

IMPOUNDMENTS					Total Number	Obs./min = 4.13
Number of Species = 25			Observation Time = 102 min		Obs. = 421	

Waterfowl	Mallard	ANPL1	54	207	2.029	49.17
Waterfowl	Pied-billed Grebe	POPO1	54	51	0.500	12.11
Waterfowl	American Coot	FUAM1	54	41	0.402	9.74
Waterfowl	Blue-winged Teal	ANDI1	54	24	0.235	5.70
Herptile	Western Painted Turtle	CHPI1	54	17	0.167	4.04
Songbird	Cliff Swallow	HIPY1	54	16	0.157	3.80
Waterfowl	Cinnamon Teal	ANCY1	54	13	0.127	3.09
Songbird	Barn Swallow	HIRU1	54	10	0.098	2.38
Waterfowl	Canada Goose	BRCA1	54	9	0.088	2.14
Waterfowl	Double-crested Cormorant	PHAU1	54	9	0.088	2.14
Songbird	Red-winged Blackbird	AGPH1	54	5	0.049	1.19
Songbird	House Finch	CAME2	54	3	0.029	0.71
Waterfowl	Great Blue Heron	ARHE1	54	2	0.020	0.48
Waterfowl	Redhead	AYAM1	54	2	0.020	0.48
Waterfowl	American White Pelican	PEER1	54	2	0.020	0.48
Songbird	American Goldfinch	CATR1	54	1	0.010	0.24
Songbird	Brewer's Blackbird	EUCY1	54	1	0.010	0.24
Songbird	Western Meadowlark	STNE1	54	1	0.010	0.24
Songbird	Tree Swallow	TABI1	54	1	0.010	0.24
Songbird	Yellow-headed Blackbird	XAXA1	54	1	0.010	0.24
Songbird	Mourning Dove	ZEMA1	54	1	0.010	0.24
Herptile	Bullfrog	RACA1	54	1	0.010	0.24

Habitat use summary from summer season multi-species census surveys at Rocky Flats Environmental Technology Site in 1997.

Major Habitat Type	Taxonomic Group	Common Name	Species Code	Habitat Type	Number of Observations	Observations/Minute	Percent of Observations in Habitat	Mean Observations/min = 2.95
	Bat	Big Brown Bat	EPFU1	54	1	0.010	0.24	
	Large Rodent	Muskrat	ONZI1	54	1	0.010	0.24	
	Waterfowl	Ruddy Duck	OXJA1	54	1	0.010	0.24	
MUDFLATS					Total Number		Obs./min = 7.35	
Number of Species = 14					Observation Time = 31 min		Obs. = 228	
	Songbird	Red-winged Blackbird	AGPH1	93	169	5.452	74.12	
	Waterfowl	Killdeer	CHVO1	93	22	0.710	9.65	
	Waterfowl	Mallard	ANPL1	93	12	0.387	5.26	
	Songbird	Western Meadowlark	STNE1	93	6	0.194	2.63	
	Songbird	Barn Swallow	HIRU1	93	4	0.129	1.75	
	Songbird	Yellow-headed Blackbird	XAXA1	93	3	0.097	1.32	
	Waterfowl	Wilson's Phalarope	PHTR1	93	3	0.097	1.32	
	Herptile	Northern Leopard Frog	RAPI1	93	2	0.065	0.88	
	Waterfowl	Double-crested Cormorant	PHAU1	93	2	0.065	0.88	
	Herptile	Western Painted Turtle	CHPI1	93	1	0.032	0.44	
	Waterfowl	Spotted Sandpiper	ACMA1	93	1	0.032	0.44	
	Waterfowl	Blue-winged Teal	ANDI1	93	1	0.032	0.44	
	Waterfowl	Great Blue Heron	ARHE1	93	1	0.032	0.44	
	Waterfowl	American Bittern	BOLE1	93	1	0.032	0.44	
RIPARIAN WOODLAND COMPLEX					Total Number		Obs./min = 4.50	
Number of Species = 40					Observation Time = 327 min		Obs. = 1470	
	Songbird	House Finch	CAME2	110	519	1.587	35.31	
	Songbird	European Starling	STVU1	110	181	0.554	12.31	
	Songbird	Western Meadowlark	STNE1	110	104	0.318	7.07	
	Songbird	Cliff Swallow	HIPY1	110	102	0.312	6.94	
	Songbird	American Goldfinch	CATR1	110	92	0.281	6.26	
	Songbird	Mourning Dove	ZEMA1	110	68	0.208	4.63	
	Songbird	Northern Oriole	ICGA1	110	52	0.159	3.54	
	Songbird	Vesper Sparrow	POGR1	110	52	0.159	3.54	
	Songbird	Red-winged Blackbird	AGPH1	110	36	0.110	2.45	
	Songbird	Barn Swallow	HIRU1	110	36	0.110	2.45	

Habitat use summary from summer season multi-species census surveys at Rocky Flats Environmental Technology Site in 1997.

Major Habitat Type	Taxonomic Group	Common Name	Species Code	Habitat Type	Number of Observations	Observations/Minute	Percent of Observations in Habitat	Mean Observations/min = 2.95
	Songbird	Song Sparrow	MEME2	110	30	0.092	2.04	
	Songbird	Brewer's Blackbird	EUCY1	110	27	0.083	1.84	
	Songbird	Blue Grosbeak	GUCA1	110	20	0.061	1.36	
	Big Game	Mule Deer	ODHE1	110	19	0.058	1.29	
	Songbird	Yellow Warbler	DEPE1	110	18	0.055	1.22	
	Songbird	Lesser Goldfinch	CAPS1	110	17	0.052	1.16	
	Songbird	American Robin	TUMI1	110	16	0.049	1.09	
	Songbird	Brown-headed Cowbird	MOAT1	110	10	0.031	0.68	
	Songbird	Black-billed Magpie	PIPI1	110	7	0.021	0.48	
	Raptor	Swainson's Hawk	BUSW1	110	7	0.021	0.48	
	Songbird	Common Yellowthroat	GETR1	110	6	0.018	0.41	
	Songbird	Say's Phoebe	SASA1	110	6	0.018	0.41	
	Songbird	Black-capped Chickadee	PAAT1	110	5	0.015	0.34	
	Songbird	Eastern Kingbird	TYTY1	110	5	0.015	0.34	
	Raptor	Great Horned Owl	BUVI1	110	5	0.015	0.34	
	Songbird	Eastern Phoebe	SAPH1	110	4	0.012	0.27	
	Raptor	American Kestrel	FASP1	110	4	0.012	0.27	
	Songbird	Grasshopper Sparrow	AMSA1	110	3	0.009	0.20	
	Songbird	Lark Sparrow	CHGR1	110	3	0.009	0.20	
	Songbird	House Wren	TRAE1	110	3	0.009	0.20	
	Lagomorph	Desert Cottontail	SYAU1	110	3	0.009	0.20	
	Songbird	Rock Dove	COLI1	110	2	0.006	0.14	
	Songbird	Northern Flicker	COAU1	110	1	0.003	0.07	
	Songbird	Common Raven	COCO1	110	1	0.003	0.07	
	Songbird	Yellow-rumped Warbler	DECO1	110	1	0.003	0.07	
	Songbird	Yellow-breasted Chat	ICVI1	110	1	0.003	0.07	
	Songbird	Rufous-sided Towhee	PIER1	110	1	0.003	0.07	
	Carnivore	American Black Bear	URAM1	110	1	0.003	0.07	
	Herptile	Bullsnake	PIME1	110	1	0.003	0.07	
	Waterfowl	Great Blue Heron	ARHE1	110	1	0.003	0.07	

Habitat use summary from summer season multi-species census surveys at Rocky Flats Environmental Technology Site in 1997.

Major Habitat Type	Taxonomic Group	Common Name	Species Code	Habitat Type	Number of Observations	Observations/Minute	Percent of Observations in Habitat	Mean Observations/min = 2.95
RIPARIAN SHRUBLAND - AMORPHA					Total Number		Obs./min = 1.61	
Number of Species = 16					Observation Time = 59 min		Obs. = 95	
	Songbird	House Finch	CAME2	211	28	0.475	29.47	
	Songbird	Vesper Sparrow	POGR1	211	20	0.339	21.05	
	Songbird	Barn Swallow	HIRU1	211	8	0.136	8.42	
	Big Game	Mule Deer	ODHE1	211	7	0.119	7.37	
	Songbird	American Goldfinch	CATR1	211	6	0.102	6.32	
	Songbird	Western Meadowlark	STNE1	211	6	0.102	6.32	
	Songbird	Grasshopper Sparrow	AMSA1	211	4	0.068	4.21	
	Songbird	Blue Grosbeak	GUCA1	211	4	0.068	4.21	
	Songbird	Brown-headed Cowbird	MOAT1	211	4	0.068	4.21	
	Songbird	Common Yellowthroat	GETR1	211	2	0.034	2.11	
	Songbird	Cliff Swallow	HIPY1	211	2	0.034	2.11	
	Songbird	Yellow Warbler	DEPE1	211	1	0.017	1.05	
	Songbird	Northern Oriole	ICGA1	211	1	0.017	1.05	
	Songbird	Eastern Phoebe	SAPH1	211	1	0.017	1.05	
	Songbird	European Starling	STVU1	211	1	0.017	1.05	
RIPARIAN SHRUBLAND - SALIX					Total Number		Obs./min = 2.43	
Number of Species = 26					Observation Time = 92 min		Obs. = 224	
	Songbird	Red-winged Blackbird	AGPH1	212	25	0.272	11.16	
	Songbird	House Finch	CAME2	212	58	0.630	25.89	
	Songbird	American Goldfinch	CATR1	212	7	0.076	3.13	
	Songbird	Lark Sparrow	CHGR1	212	3	0.033	1.34	
	Songbird	Yellow Warbler	DEPE1	212	1	0.011	0.45	
	Songbird	Brewer's Blackbird	EUCY1	212	1	0.011	0.45	
	Songbird	Common Yellowthroat	GETR1	212	10	0.109	4.46	
	Songbird	Blue Grosbeak	GUCA1	212	5	0.054	2.23	
	Songbird	Cliff Swallow	HIPY1	212	20	0.217	8.93	
	Songbird	Barn Swallow	HIRU1	212	16	0.174	7.14	
	Songbird	Northern Oriole	ICGA1	212	3	0.033	1.34	
	Songbird	Song Sparrow	MEME2	212	10	0.109	4.46	

Habitat use summary from summer season multi-species census surveys at Rocky Flats Environmental Technology Site in 1997.

Major Habitat Type	Taxonomic Group	Common Name	Species Code	Habitat Type	Number of Observations	Observations/Minute	Percent of Observations in Habitat	Mean Observations/min = 2.95
	Songbird	Brown-headed Cowbird	MOAT1	212	1	0.011	0.45	
	Songbird	Black-billed Magpie	PIPI1	212	2	0.022	0.89	
	Songbird	Vesper Sparrow	POGR1	212	15	0.163	6.70	
	Songbird	Eastern Phoebe	SAPH1	212	2	0.022	0.89	
	Songbird	Say's Phoebe	SASA1	212	1	0.011	0.45	
	Songbird	Western Meadowlark	STNE1	212	17	0.185	7.59	
	Songbird	European Starling	STVU1	212	1	0.011	0.45	
	Songbird	Violet-green Swallow	TATH1	212	1	0.011	0.45	
	Songbird	House Wren	TRAE1	212	2	0.022	0.89	
	Songbird	American Robin	TUMI1	212	2	0.022	0.89	
	Songbird	Mourning Dove	ZEMA1	212	12	0.130	5.36	
	Big Game	Mule Deer	ODHE1	212	6	0.065	2.68	
	Big Game	White-tailed Deer	ODVI1	212	3	0.033	1.34	
TALL UPLAND SHRUBLAND					Total Number		Obs/min = 2.82	
Number of Species = 35					Observation Time = 212 min		Obs. = 597	
	Songbird	Rufous-sided Towhee	PIER1	230	97	0.458	16.25	
	Songbird	House Finch	CAME2	230	64	0.302	10.72	
	Songbird	American Goldfinch	CATR1	230	58	0.274	9.72	
	Songbird	Lark Bunting	CAME3	230	55	0.259	9.21	
	Songbird	Vesper Sparrow	POGR1	230	46	0.217	7.71	
	Songbird	American Robin	TUMI1	230	38	0.179	6.37	
	Big Game	Mule Deer	ODHE1	230	36	0.170	6.03	
	Songbird	Western Meadowlark	STNE1	230	34	0.160	5.70	
	Songbird	Song Sparrow	MEME2	230	29	0.137	4.86	
	Songbird	Red-winged Blackbird	AGPH1	230	22	0.104	3.69	
	Songbird	Lesser Goldfinch	CAPS1	230	16	0.075	2.68	
	Songbird	Green-tailed Towhee	PICH1	230	12	0.057	2.01	
	Songbird	Cliff Swallow	HIPY1	230	11	0.052	1.84	
	Songbird	Black-capped Chickadee	PAAT1	230	11	0.052	1.84	
	Songbird	Black-billed Magpie	PIPI1	230	11	0.052	1.84	
	Songbird	Yellow-breasted Chat	ICVI1	230	7	0.033	1.17	

Habitat use summary from summer season multi-species census surveys at Rocky Flats Environmental Technology Site in 1997.

Major Habitat Type	Taxonomic Group	Common Name	Species Code	Habitat Type	Number of Observations	Observations/Minute	Percent of Observations in Habitat	Mean Observations/min = 2.95
	Songbird	Brown-headed Cowbird	MOAT1	230	7	0.033	1.17	
	Songbird	Yellow Warbler	DEPE1	230	5	0.024	0.84	
	Songbird	Sage Thrasher	ORMO1	230	5	0.024	0.84	
	Songbird	Chipping Sparrow	SPPA1	230	4	0.019	0.67	
	Songbird	House Wren	TRAE1	230	4	0.019	0.67	
	Songbird	Grasshopper Sparrow	AMSA1	230	3	0.014	0.50	
	Songbird	Common Yellowthroat	GETR1	230	3	0.014	0.50	
	Songbird	Northern Oriole	ICGA1	230	3	0.014	0.50	
	Songbird	Broad-tailed Hummingbird	SEPL1	230	3	0.014	0.50	
	Songbird	Golden-crowned Kinglet	RESA1	230	2	0.009	0.34	
	Songbird	Say's Phoebe	SASA1	230	2	0.009	0.34	
	Songbird	Mourning Dove	ZEMA1	230	2	0.009	0.34	
	Songbird	Lark Sparrow	CHGR1	230	1	0.005	0.17	
	Songbird	Western Wood-Pewee	COSO1	230	1	0.005	0.17	
	Songbird	Loggerhead Shrike	LALU1	230	1	0.005	0.17	
	Songbird	Eastern Phoebe	SAPH1	230	1	0.005	0.17	
	Carnivore	Coyote	CALA1	230	1	0.005	0.17	
	Raptor	Great Horned Owl	BUVI1	230	1	0.005	0.17	
	Raptor	American Kestrel	FASP1	230	1	0.005	0.17	
MESIC MIXED GRASSLAND					Total Number		Obs./min = 1.7	
Number of Species = 17					Observation Time = 77 min		Obs. = 131	
	Songbird	House Finch	CAME2	322	28	0.364	21.37	
	Songbird	Western Meadowlark	STNE1	322	25	0.325	19.08	
	Songbird	European Starling	STVU1	322	19	0.247	14.50	
	Songbird	Vesper Sparrow	POGR1	322	17	0.221	12.98	
	Big Game	Mule Deer	ODHE1	322	13	0.169	9.92	
	Songbird	Barn Swallow	HIRU1	322	7	0.091	5.34	
	Songbird	Eastern Phoebe	SAPH1	322	4	0.052	3.05	
	Songbird	Blue Grosbeak	GUCA1	322	3	0.039	2.29	
	Songbird	Western Kingbird	TYVE1	322	3	0.039	2.29	
	Lagomorph	Desert Cottontail	SYAU1	322	3	0.039	2.29	

Habitat use summary from summer season multi-species census surveys at Rocky Flats Environmental Technology Site in 1997.

Major Habitat Type	Taxonomic Group	Common Name	Species Code	Habitat Type	Number of Observations	Observations/Minute	Percent of Observations in Habitat	Mean Observations/min = 2.95
	Songbird	Northern Oriole	ICGA1	322	2	0.026	1.53	
	Songbird	Sage Thrasher	ORMO1	322	2	0.026	1.53	
	Songbird	Cliff Swallow	HIPY1	322	1	0.013	0.76	
	Songbird	Mourning Dove	ZEMA1	322	1	0.013	0.76	
	Carnivore	Coyote	CALA1	322	1	0.013	0.76	
	Raptor	Red-tailed Hawk	BUJA1	322	1	0.013	0.76	
	Raptor	American Kestrel	FASP1	322	1	0.013	0.76	
XERIC MIXED GRASSLAND						Total Number	Obs./min = 2.18	
Number of Species = 13				Observation Time = 126 min	Obs. = 275			
	Songbird	Vesper Sparrow	POGR1	323	127	1.008	46.18	
	Songbird	Western Meadowlark	STNE1	323	43	0.341	15.64	
	Songbird	House Finch	CAME2	323	37	0.294	13.45	
	Songbird	Red-winged Blackbird	AGPH1	323	36	0.286	13.09	
	Songbird	Cliff Swallow	HIPY1	323	9	0.071	3.27	
	Songbird	Horned Lark	ERAL1	323	7	0.056	2.55	
	Songbird	Brewer's Blackbird	EUCY1	323	4	0.032	1.45	
	Songbird	Blue Grosbeak	GUCA1	323	3	0.024	1.09	
	Big Game	Mule Deer	ODHE1	323	3	0.024	1.09	
	Songbird	Common Poorwill	PHNU1	323	2	0.016	0.73	
	Songbird	Western Kingbird	TYVE1	323	2	0.016	0.73	
	Songbird	Say's Phoebe	SASA1	323	1	0.008	0.36	
	Songbird	Broad-tailed Hummingbird	SEPL1	323	1	0.008	0.36	
RECLAIMED GRASSLAND						Total Number	Obs./min = 1.44	
Number of Species = 10				Observation Time = 34 min	Obs. = 49			
	Songbird	House Finch	CAME2	324	16	0.471	32.65	
	Songbird	Western Meadowlark	STNE1	324	9	0.265	18.37	
	Songbird	Barn Swallow	HIRU1	324	6	0.176	12.24	
	Songbird	Vesper Sparrow	POGR1	324	6	0.176	12.24	
	Songbird	Mourning Dove	ZEMA1	324	5	0.147	10.20	
	Songbird	Red-winged Blackbird	AGPH1	324	2	0.059	4.08	
	Big Game	Mule Deer	ODHE1	324	2	0.059	4.08	

Habitat use summary from summer season multi-species census surveys at Rocky Flats Environmental Technology Site in 1997.

Major Habitat Type	Taxonomic Group	Common Name	Species Code	Habitat Type	Number of Observations	Observations/Minute	Percent of Observations in Habitat	Mean Observations/min = 2.95
	Songbird	Common Nighthawk	CHMI1	324	1	0.029	2.04	
	Songbird	European Starling	STVU1	324	1	0.029	2.04	
	Songbird	American Robin	TUMI1	324	1	0.029	2.04	
DISTURBED AND STRUCTURES					Total Number		Obs./min = 3.15	
Number of Species = 3					Observation Time = 13 min		Obs. = 41	
	Lagomorph	Desert Cottontail	SYAU1	410	3	0.231	7.32	
	Lagomorph	Desert Cottontail	SYAU1	420	1	0.077	2.44	
	Songbird	House Finch	CAME2	540	33	2.538	80.49	
	Lagomorph	Desert Cottontail	SYAU1	540	3	0.231	7.32	
	Songbird	Vesper Sparrow	POGR1	540	1	0.077	2.44	

Habitat use summary from fall season multi-species census surveys at Rocky Flats Environmental Technology Site in 1997.

Major Habitat Type	Taxonomic Group	Common Name	Species Code	Habitat Type	Number of Observations	Observations/Minute	Percent of Observations in Habitat	Mean Observations/min = 1.41
WET MEADOW					Total Number		Obs./min = 0.60	
Number of Species = 6					Observation Time = 63 min		Obs. = 38	
	Songbird	Vesper Sparrow	POGR1	10	18	0.286	47.37	
	Songbird	Western Meadowlark	STNE1	10	12	0.190	31.58	
	Big Game	Mule Deer	ODHE1	10	4	0.063	10.53	
	Songbird	Grasshopper Sparrow	AMSA1	10	2	0.032	5.26	
	Songbird	Song Sparrow	MEME2	10	1	0.016	2.63	
	Songbird	Black-billed Magpie	PIPI1	10	1	0.016	2.63	
SHORT MARSH					Total Number		Obs./min = 0.61	
Number of Species = 14					Observation Time = 93 min		Obs. = 57	
	Big Game	Mule Deer	ODHE1	20	17	0.183	29.82	
	Songbird	Song Sparrow	MEME2	20	9	0.097	15.79	
	Songbird	Western Meadowlark	STNE1	20	9	0.097	15.79	
	Songbird	American Goldfinch	CATR1	20	6	0.065	10.53	
	Songbird	Vesper Sparrow	POGR1	20	3	0.032	5.26	
	Songbird	American Tree Sparrow	SPAR1	20	3	0.032	5.26	
	Songbird	House Finch	CAME2	20	2	0.022	3.51	
	Carnivore	Coyote	CALA1	20	2	0.022	3.51	
	Songbird	Grasshopper Sparrow	AMSA1	20	1	0.011	1.75	
	Songbird	Black-billed Magpie	PIPI1	20	1	0.011	1.75	
	Big Game	White-tailed Deer	ODVI1	20	1	0.011	1.75	
	Raptor	Prairie Falcon	FAME1	20	1	0.011	1.75	
	Waterfowl	Mallard	ANPL1	20	1	0.011	1.75	
	Waterfowl	Virginia Rail	RALI1	20	1	0.011	1.75	
TALL MARSH					Total Number		Obs./min = 0.60	
Number of Species = 8					Observation Time = 65 min		Obs. = 39	
	Songbird	Song Sparrow	MEME2	30	11	0.169	28.21	
	Songbird	Western Meadowlark	STNE1	30	8	0.123	20.51	
	Songbird	Black-billed Magpie	PIPI1	30	5	0.077	12.82	
	Songbird	Red-winged Blackbird	AGPH1	30	4	0.062	10.26	
	Songbird	White-crowned Sparrow	ZOLE1	30	4	0.062	10.26	
	Songbird	Vesper Sparrow	POGR1	30	3	0.046	7.69	
	Songbird	Chipping Sparrow	SPPA1	30	3	0.046	7.69	
	Songbird	American Tree Sparrow	SPAR1	30	1	0.015	2.56	

Habitat use summary from fall season multi-species census surveys at Rocky Flats Environmental Technology Site in 1997.

Major Habitat Type	Taxonomic Group	Common Name	Species Code	Habitat Type	Number of Observations	Observations/Minute	Percent of Observations in Habitat	Mean Observations/min = 1.41
IMPOUNDMENTS					Total Number		Obs./min = 4.27	
Number of Species = 18					Observation Time = 81 min		Obs. = 346	
	Waterfowl	Mallard	ANPL1	54	64	0.790	18.50	
	Waterfowl	Gadwall	ANST1	54	64	0.790	18.50	
	Waterfowl	Ring-necked Duck	AYCO1	54	60	0.741	17.34	
	Waterfowl	Bufflehead	BUAL1	54	57	0.704	16.47	
	Waterfowl	Blue-winged Teal	ANDI1	54	21	0.259	6.07	
	Waterfowl	American Coot	FUAM1	54	18	0.222	5.20	
	Herptile	Western Painted Turtle	CHPI1	54	17	0.210	4.91	
	Waterfowl	Pied-billed Grebe	POPO1	54	14	0.173	4.05	
	Waterfowl	Green-winged Teal	ANCR1	54	12	0.148	3.47	
	Songbird	House Finch	CAME2	54	5	0.062	1.45	
	Songbird	Cliff Swallow	HIPY1	54	4	0.049	1.16	
	Large Rodent	Muskrat	ONZI1	54	3	0.037	0.87	
	Waterfowl	Lesser Scaup	AYAF1	54	2	0.025	0.58	
	Songbird	Vesper Sparrow	POGR1	54	1	0.012	0.29	
	Raptor	Red-tailed Hawk	BUJA1	54	1	0.012	0.29	
	Waterfowl	Western Grebe	AEOC1	54	1	0.012	0.29	
	Waterfowl	Northern Shoveler	ANCL1	54	1	0.012	0.29	
	Waterfowl	Common Merganser	MEME1	54	1	0.012	0.29	
MUDEFLATS					Total Number		Obs./min = 4.94	
Number of Species = 7					Observation Time = 18 min		Obs. = 89	
	Waterfowl	Mallard	ANPL1	93	35	1.944	39.33	
	Waterfowl	Killdeer	CHVO1	93	28	1.556	31.46	
	Songbird	Western Meadowlark	STNE1	93	14	0.778	15.73	
	Songbird	Red-winged Blackbird	AGPH1	93	6	0.333	6.74	
	Waterfowl	Blue-winged Teal	ANDI1	93	4	0.222	4.49	
	Songbird	Yellow-rumped Warbler	DECO1	93	1	0.056	1.12	
	Songbird	Vesper Sparrow	POGR1	93	1	0.056	1.12	
RIPARIAN WOODLAND COMPLEX					Total Number		Obs./min = 1.25	
Number of Species = 34					Observation Time = 313 min		Obs. = 390	
	Songbird	House Finch	CAME2	110	66	0.211	16.92	
	Songbird	Black-billed Magpie	PIPI1	110	55	0.176	14.10	
	Songbird	Western Meadowlark	STNE1	110	44	0.141	11.28	

Habitat use summary from fall season multi-species census surveys at Rocky Flats Environmental Technology Site in 1997.

Major Habitat Type	Taxonomic Group	Common Name	Species Code	Habitat Type	Number of Observations	Observations/Minute	Percent of Observations in Habitat	Mean Observations/min = 1.41
	Songbird	European Starling	STVU1	110	41	0.131	10.51	
	Songbird	American Tree Sparrow	SPAR1	110	37	0.118	9.49	
	Songbird	Song Sparrow	MEME2	110	24	0.077	6.15	
	Songbird	Northern Flicker	COAU1	110	16	0.051	4.10	
	Big Game	Mule Deer	ODHE1	110	15	0.048	3.85	
	Songbird	Vesper Sparrow	POGR1	110	13	0.042	3.33	
	Songbird	Cliff Swallow	HIPY1	110	9	0.029	2.31	
	Songbird	American Goldfinch	CATR1	110	9	0.029	2.31	
	Songbird	White-crowned Sparrow	ZOLE1	110	8	0.026	2.05	
	Raptor	Great Horned Owl	BUVI1	110	7	0.022	1.79	
	Songbird	Yellow-rumped Warbler	DECO1	110	6	0.019	1.54	
	Songbird	House Wren	TRAE1	110	4	0.013	1.03	
	Raptor	American Kestrel	FASP1	110	4	0.013	1.03	
	Songbird	Rufous-sided Towhee	PIER1	110	4	0.013	1.03	
	Songbird	Black-capped Chickadee	PAAT1	110	4	0.013	1.03	
	Songbird	American Robin	TUMI1	110	4	0.013	1.03	
	Songbird	Mourning Dove	ZEMA1	110	3	0.010	0.77	
	Carnivore	Coyote	CALA1	110	2	0.006	0.51	
	Raptor	Red-tailed Hawk	BUJA1	110	2	0.006	0.51	
	Songbird	Horned Lark	ERAL1	110	2	0.006	0.51	
	Songbird	Common Raven	COCO1	110	1	0.003	0.26	
	Waterfowl	Killdeer	CHVO1	110	1	0.003	0.26	
	Songbird	Red-winged Blackbird	AGPH1	110	1	0.003	0.26	
	Songbird	Western Kingbird	TYVE1	110	1	0.003	0.26	
	Songbird	Dark-eyed Junco	JUHY1	110	1	0.003	0.26	
	Songbird	Grasshopper Sparrow	AMSA1	110	1	0.003	0.26	
	Raptor	Cooper's Hawk	ACCO1	110	1	0.003	0.26	
	Raptor	Prairie Falcon	FAME1	110	1	0.003	0.26	
	Songbird	Common Yellowthroat	GETR1	110	1	0.003	0.26	
	Songbird	Hairy Woodpecker	PIVI1	110	1	0.003	0.26	
	Songbird	Say's Phoebe	SASA1	110	1	0.003	0.26	

Habitat use summary from fall season multi-species census surveys at Rocky Flats Environmental Technology Site in 1997.

Major Habitat Type	Taxonomic Group	Common Name	Species Code	Habitat Type	Number of Observations	Observations/Minute	Percent of Observations in Habitat	Mean Observations/min = 1.41
RIPARIAN SHRUBLAND - AMORPHA					Total Number Obs. = 26		Obs./min = 0.47	
Number of Species = 7					Observation Time = 55 min			
	Songbird	Chipping Sparrow	SPPA1	211	6	0.109	23.08	
	Songbird	House Finch	CAME2	211	5	0.091	19.23	
	Songbird	Song Sparrow	MEME2	211	4	0.073	15.38	
	Songbird	Western Meadowlark	STNE1	211	4	0.073	15.38	
	Songbird	Vesper Sparrow	POGR1	211	3	0.055	11.54	
	Big Game	Mule Deer	ODHE1	211	3	0.055	11.54	
	Songbird	Grasshopper Sparrow	AMSA1	211	1	0.018	3.85	
RIPARIAN SHRUBLAND - SALIX					Total Number Obs. = 118		Obs./min = 1.37	
Number of Species = 16					Observation Time = 86 min			
	Songbird	Western Meadowlark	STNE1	212	28	0.326	23.73	
	Songbird	House Finch	CAME2	212	25	0.291	21.19	
	Big Game	Mule Deer	ODHE1	212	17	0.198	14.41	
	Songbird	Black-billed Magpie	PIPI1	212	10	0.116	8.47	
	Songbird	White-crowned Sparrow	ZOLE1	212	9	0.105	7.63	
	Songbird	Song Sparrow	MEME2	212	8	0.093	6.78	
	Songbird	Red-winged Blackbird	AGPH1	212	7	0.081	5.93	
	Songbird	American Goldfinch	CATR1	212	3	0.035	2.54	
	Songbird	Rufous-sided Towhee	PIER1	212	2	0.023	1.69	
	Songbird	Vesper Sparrow	POGR1	212	2	0.023	1.69	
	Songbird	Mourning Dove	ZEMA1	212	2	0.023	1.69	
	Songbird	Northern Flicker	COAU1	212	1	0.012	0.85	
	Songbird	Yellow Warbler	DEPE1	212	1	0.012	0.85	
	Songbird	Say's Phoebe	SASA1	212	1	0.012	0.85	
	Songbird	American Robin	TUMI1	212	1	0.012	0.85	
	Carnivore	Raccoon	PRLO1	212	1	0.012	0.85	
TALL UPLAND SHRUBLAND					Total Number Obs. = 228		Obs./min = 1.25	
Number of Species = 24					Observation Time = 182 min			
	Songbird	Rufous-sided Towhee	PIER1	230	46	0.253	20.18	
	Big Game	Mule Deer	ODHE1	230	45	0.247	19.74	
	Songbird	House Finch	CAME2	230	35	0.192	15.35	
	Songbird	Vesper Sparrow	POGR1	230	15	0.082	6.58	
	Songbird	Chipping Sparrow	SPPA1	230	15	0.082	6.58	

Habitat use summary from fall season multi-species census surveys at Rocky Flats Environmental Technology Site in 1997.

Major Habitat Type	Taxonomic Group	Common Name	Species Code	Habitat Type	Number of Observations	Observations/Minute	Percent of Observations in Habitat	Mean Observations/min = 1.41
	Songbird	Song Sparrow	MEME2	230	13	0.071	5.70	
	Songbird	Black-billed Magpie	PIPI1	230	11	0.060	4.82	
	Songbird	Black-capped Chickadee	PAAT1	230	8	0.044	3.51	
	Songbird	White-crowned Sparrow	ZOLE1	230	8	0.044	3.51	
	Songbird	American Goldfinch	CATR1	230	7	0.038	3.07	
	Songbird	American Tree Sparrow	SPAR1	230	5	0.027	2.19	
	Carnivore	Coyote	CALA1	230	4	0.022	1.75	
	Songbird	Northern Flicker	COAU1	230	2	0.011	0.88	
	Songbird	Horned Lark	ERAL1	230	2	0.011	0.88	
	Songbird	Golden-crowned Kinglet	RESA1	230	2	0.011	0.88	
	Songbird	American Robin	TUMI1	230	2	0.011	0.88	
	Songbird	Red-winged Blackbird	AGPH1	230	1	0.005	0.44	
	Songbird	Common Raven	COCO1	230	1	0.005	0.44	
	Songbird	Green-tailed Towhee	PICH1	230	1	0.005	0.44	
	Songbird	Rock Wren	SAOB1	230	1	0.005	0.44	
	Songbird	European Starling	STVU1	230	1	0.005	0.44	
	Big Game	White-tailed Deer	ODVI1	230	1	0.005	0.44	
	Big Game	MuleXWhite-tailed Deer Hybrid	ODXVI	230	1	0.005	0.44	
	Raptor	Northern Harrier	CICY1	230	1	0.005	0.44	

MESIC MIXED GRASSLAND					Total Number		Obs./min = 0.84	
Number of Species = 9					Observation Time = 62 min		Obs. = 52	

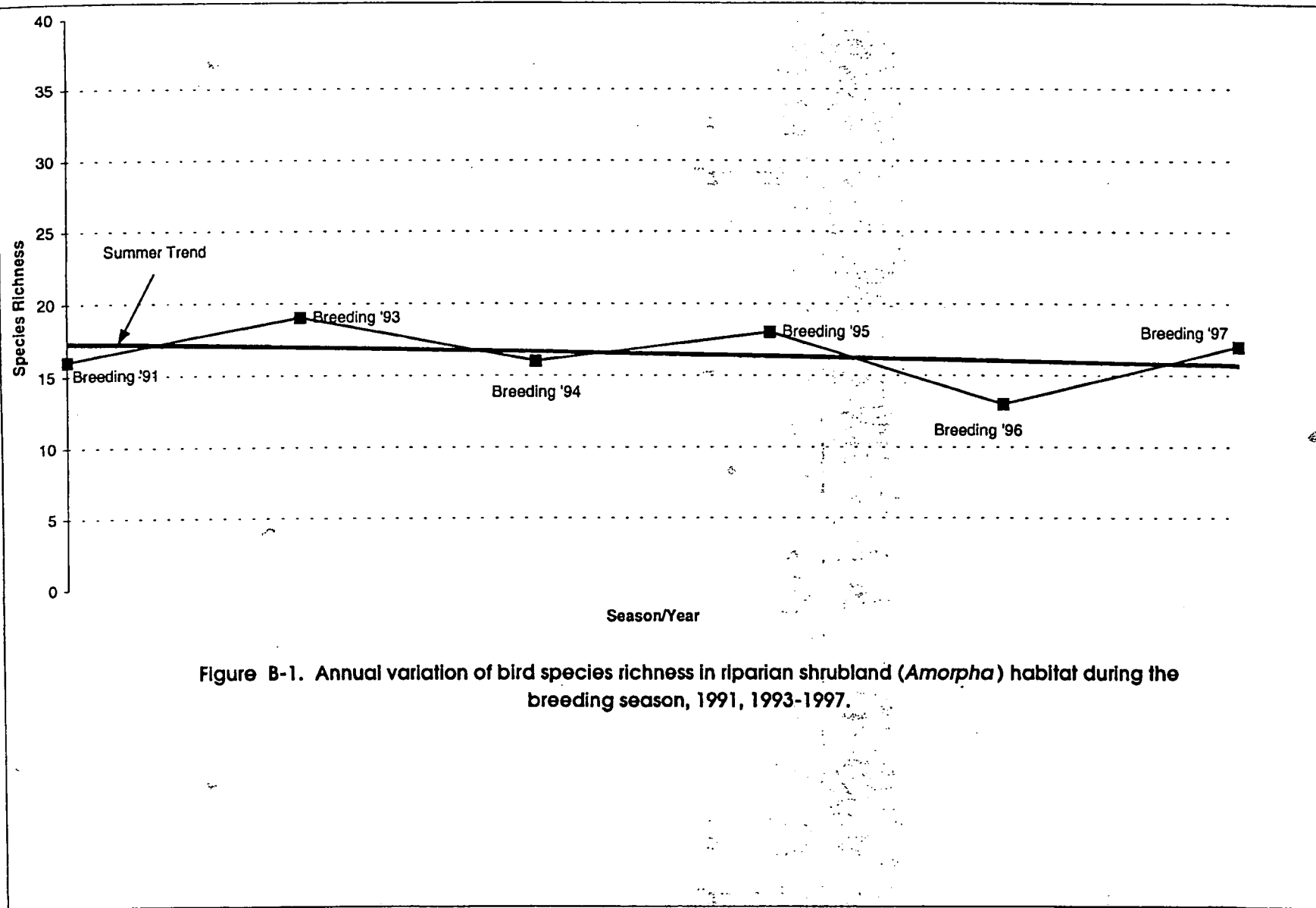
Big Game	Mule Deer	ODHE1	322	22	0.355	42.31
Songbird	Western Meadowlark	STNE1	322	12	0.194	23.08
Songbird	Vesper Sparrow	POGR1	322	5	0.081	9.62
Songbird	House Finch	CAME2	322	4	0.065	7.69
Songbird	American Tree Sparrow	SPAR1	322	4	0.065	7.69
Lagomorph	Desert Cottontail	SYAU1	322	2	0.032	3.85
Songbird	Say's Phoebe	SASA1	322	1	0.016	1.92
Songbird	American Robin	TUMI1	322	1	0.016	1.92
Songbird	Western Kingbird	TYVE1	322	1	0.016	1.92

Habitat use summary from fall season multi-species census surveys at Rocky Flats Environmental Technology Site in 1997.

Major Habitat Type	Taxonomic Group	Common Name	Species Code	Habitat Type	Number of Observations	Observations/Minute	Percent of Observations in Habitat	Mean Observations/min = 1.41
XERIC MIXED GRASSLAND					Total Number		Obs./min = 0.26	
Number of Species = 9					Observation Time = 161 min		Obs. = 42	
	Songbird	Western Meadowlark	STNE1	323	17	0.106	40.48	
	Songbird	Vesper Sparrow	POGR1	323	13	0.081	30.95	
	Carnivore	Coyote	CALA1	323	3	0.019	7.14	
	Songbird	Grasshopper Sparrow	AMSA1	323	2	0.012	4.76	
	Songbird	Horned Lark	ERAL1	323	2	0.012	4.76	
	Raptor	Red-tailed Hawk	BUJA1	323	2	0.012	4.76	
	Songbird	Black-billed Magpie	PIPI1	323	1	0.006	2.38	
	Songbird	Vesper Sparrow	SAOB1	323	1	0.006	2.38	
	Lagomorph	Jackrabbit Specieus	LEP1	323	1	0.006	2.38	
RECLAIMED GRASSLAND					Total Number		Obs./min = 0.94	
Number of Species = 4					Observation Time = 16 min		Obs. = 15	
	Songbird	Western Meadowlark	STNE1	324	12	0.750	80.00	
	Songbird	House Finch	CAME2	324	1	0.063	6.67	
	Songbird	American Robin	TUMI1	324	1	0.063	6.67	
	Lagomorph	Desert Cottontail	SYAU1	324	1	0.063	6.67	
DISTURBED AND STRUCTURES					Total Number		Obs./min = 0.92	
Number of Species = 6					Observation Time = 26 min		Obs. = 24	
		None	N/A	420	0	0.000	0.00	
	Raptor	Great Horned Owl	BUVI1	520	2	0.077	8.33	
	Songbird	Western Meadowlark	STNE1	530	2	0.077	8.33	
	Songbird	House Wren	TRAE1	530	1	0.038	4.17	
	Lagomorph	Desert Cottontail	SYAU1	530	1	0.038	4.17	
	Songbird	House Finch	CAME2	540	15	0.577	62.50	
	Lagomorph	Desert Cottontail	SYAU1	540	2	0.077	8.33	
	Songbird	White-crowned Sparrow	ZOLE1	540	1	0.038	4.17	

Appendix E

Breeding Season Bird and Winter Bird Species Richness Summaries by Habitat



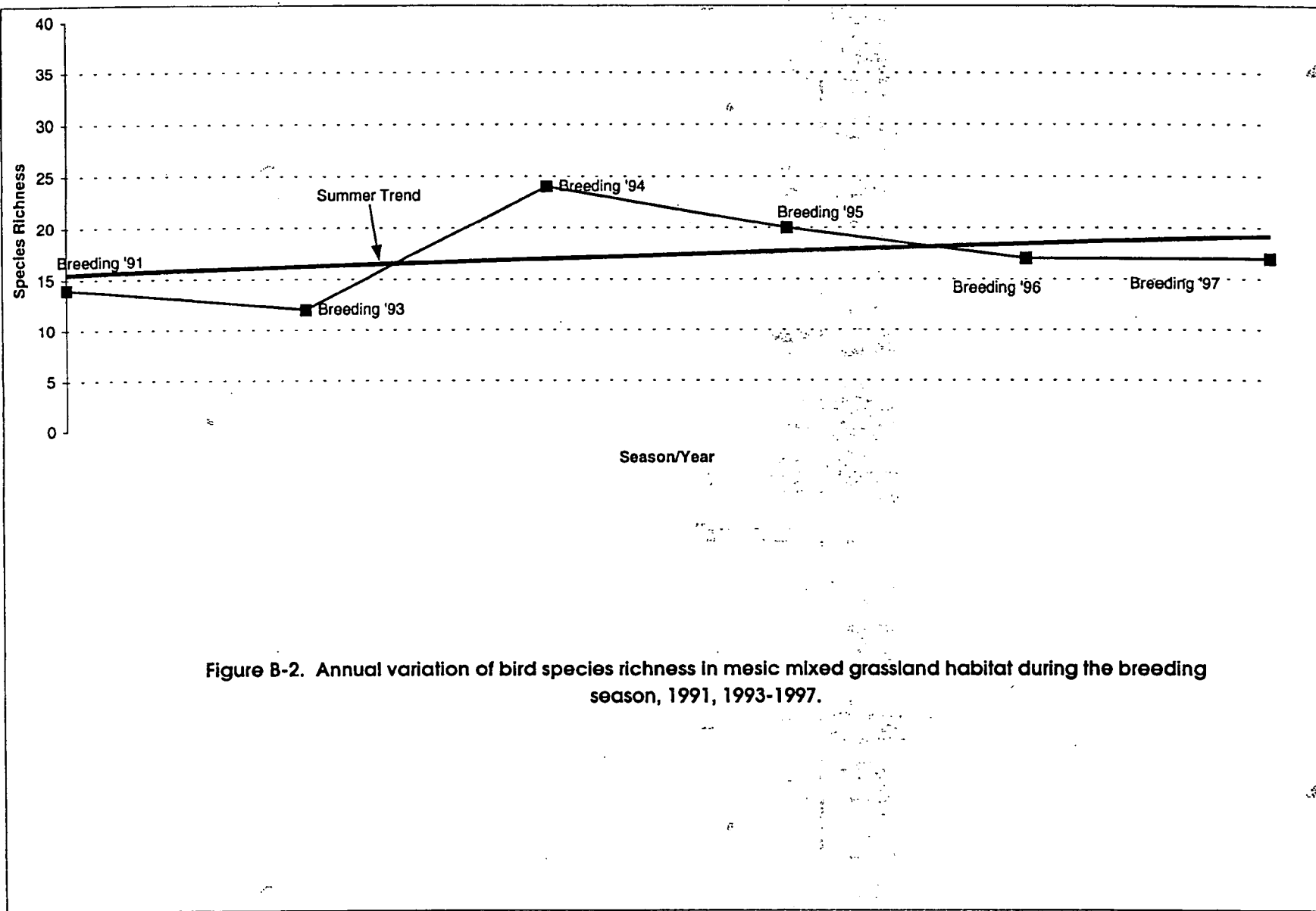
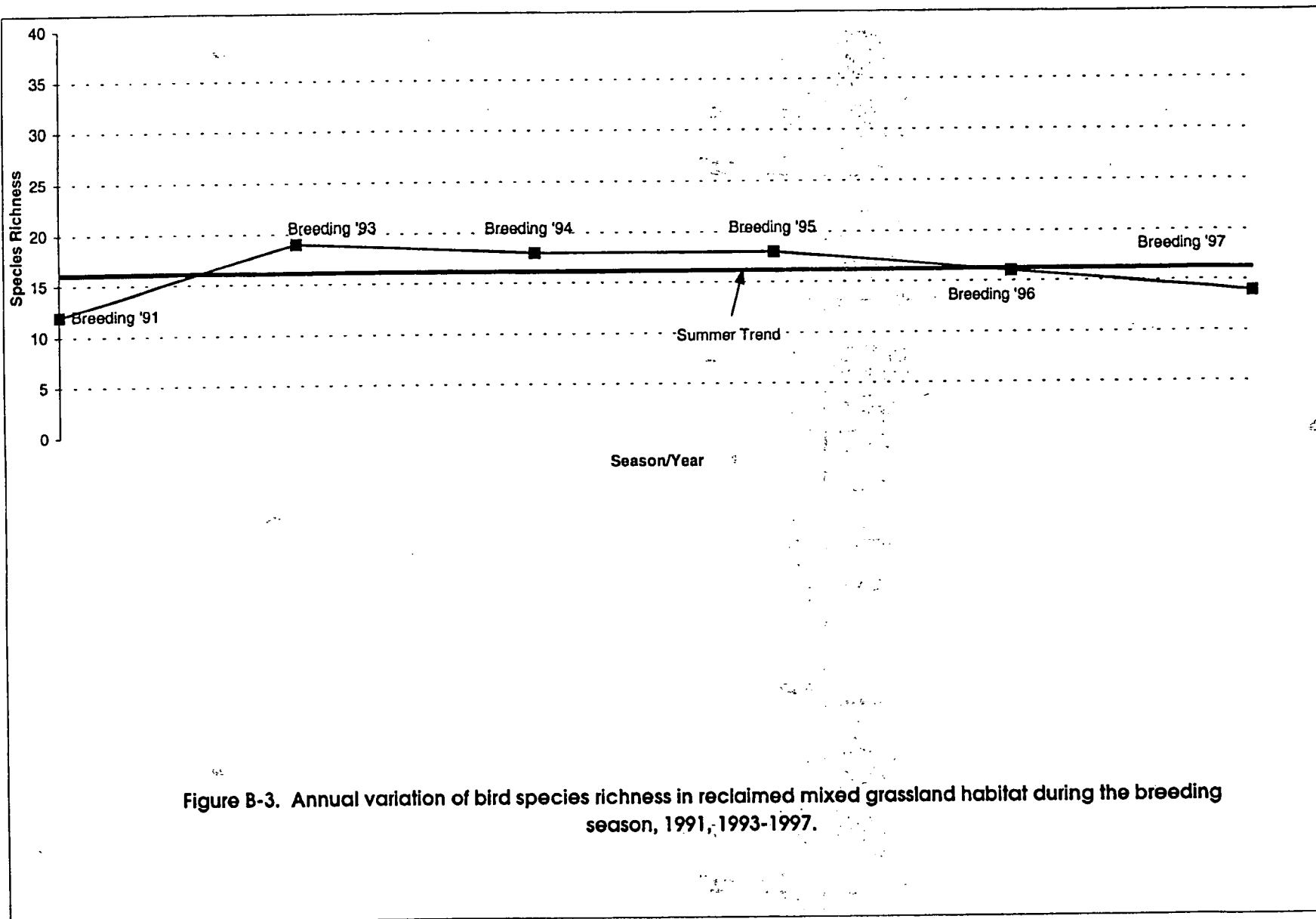


Figure B-2. Annual variation of bird species richness in mesic mixed grassland habitat during the breeding season, 1991, 1993-1997.



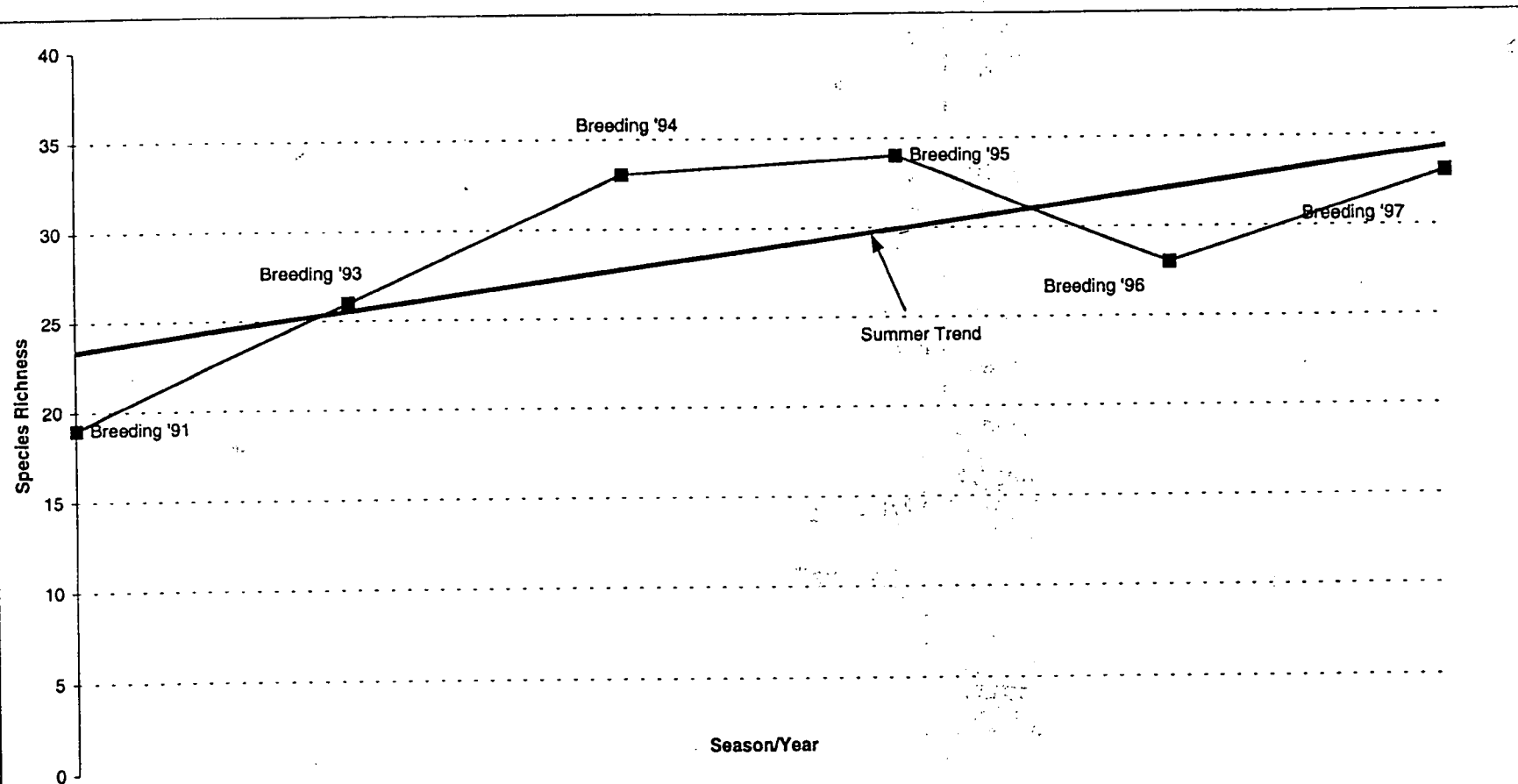
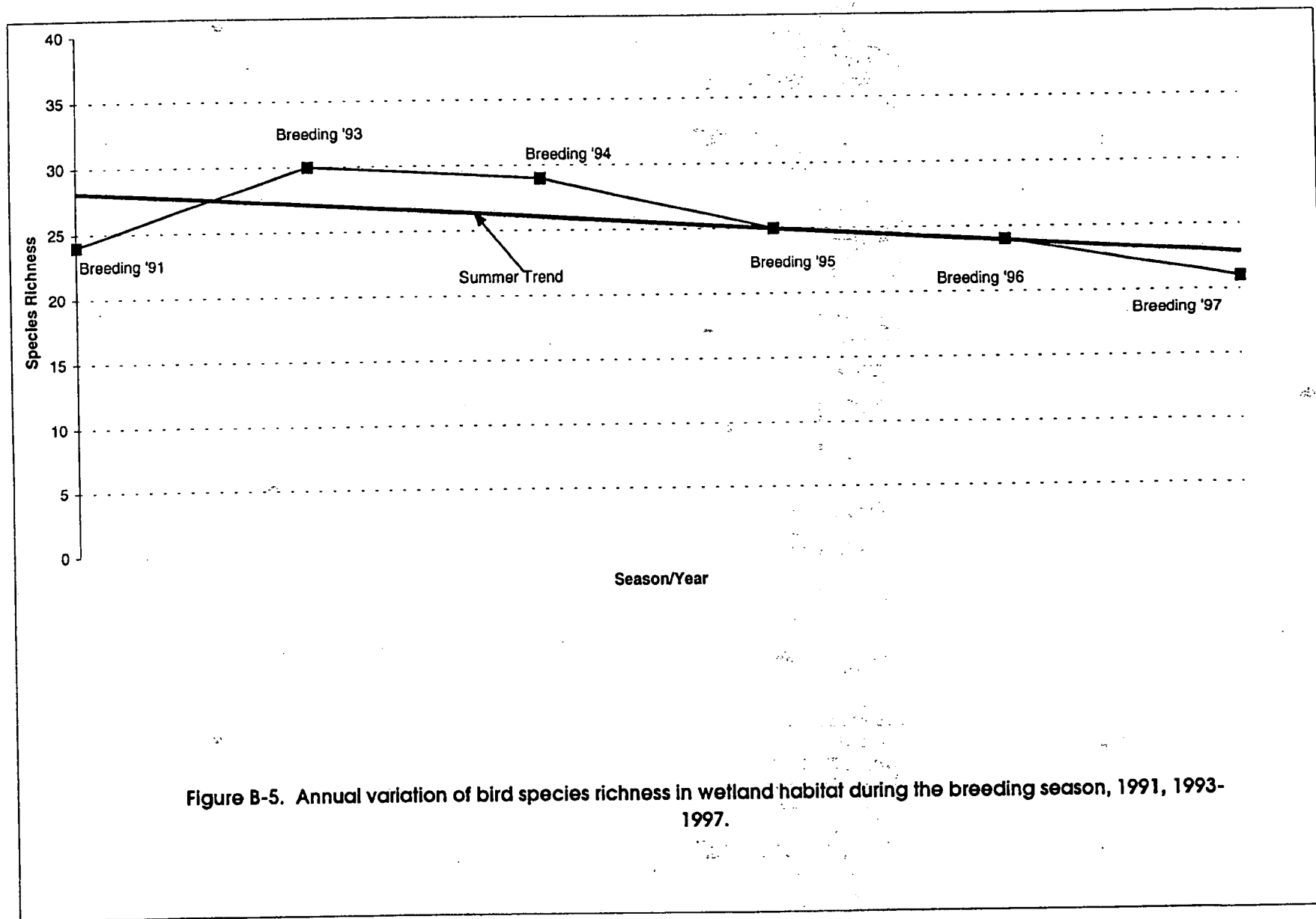


Figure B-4. Annual variation of bird species richness in tall upland shrub habitat during the breeding season, 1991, 1993-1997.



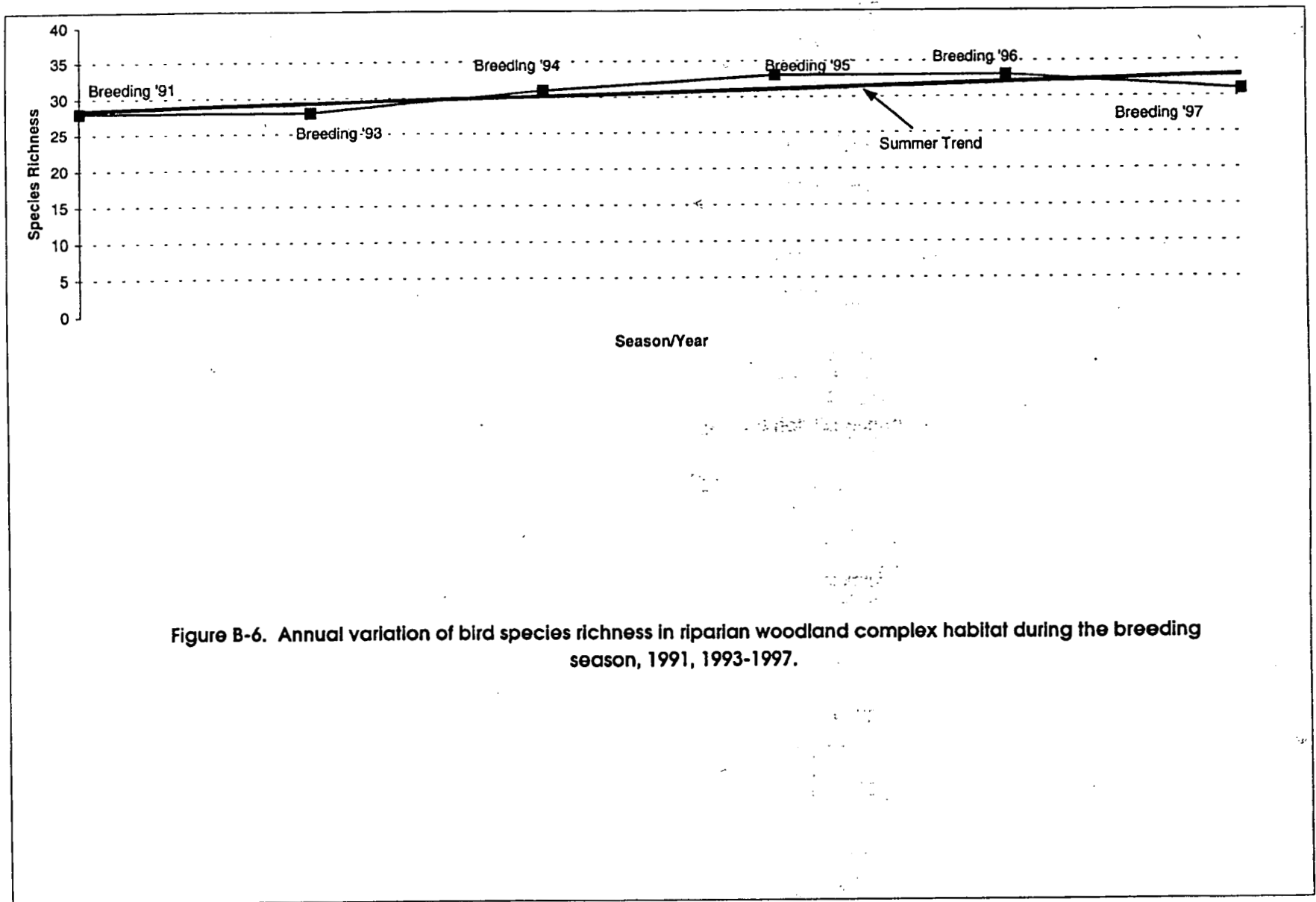
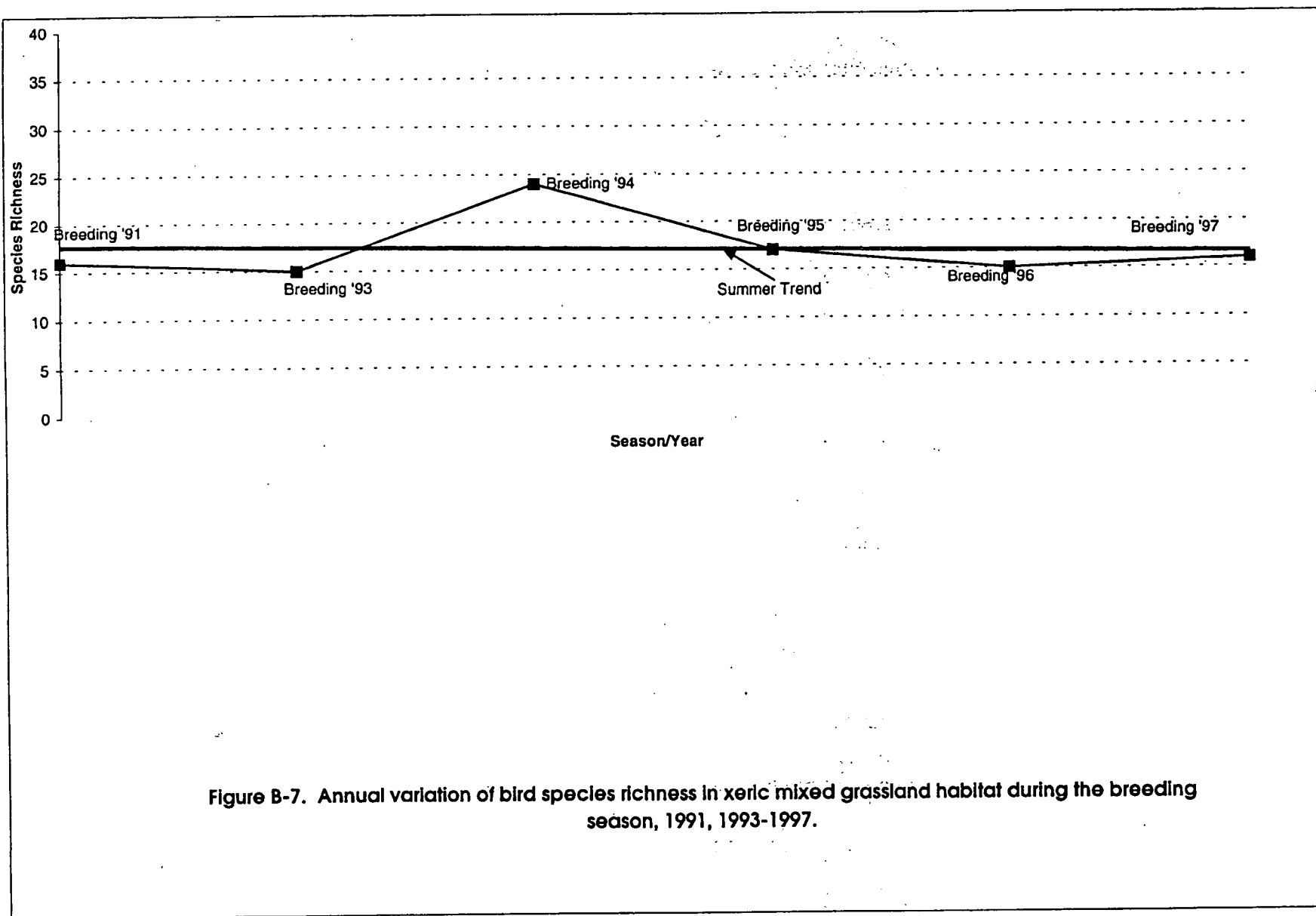


Figure B-6. Annual variation of bird species richness in riparian woodland complex habitat during the breeding season, 1991, 1993-1997.



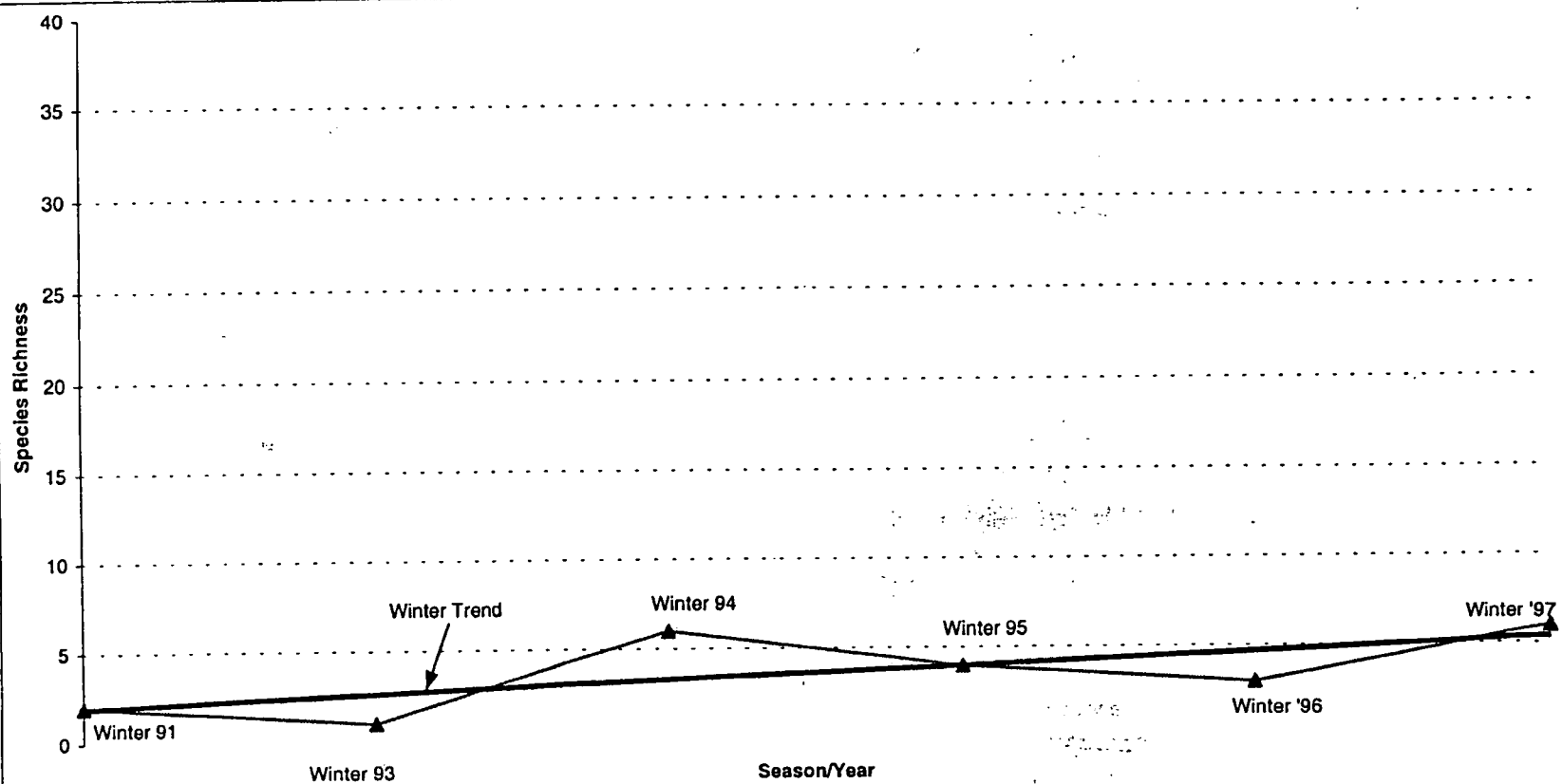


Figure W-1. Annual variation of bird species richness in riparian shrubland (*Amorpha*) habitat during the winter months, 1991, 1993-1997.

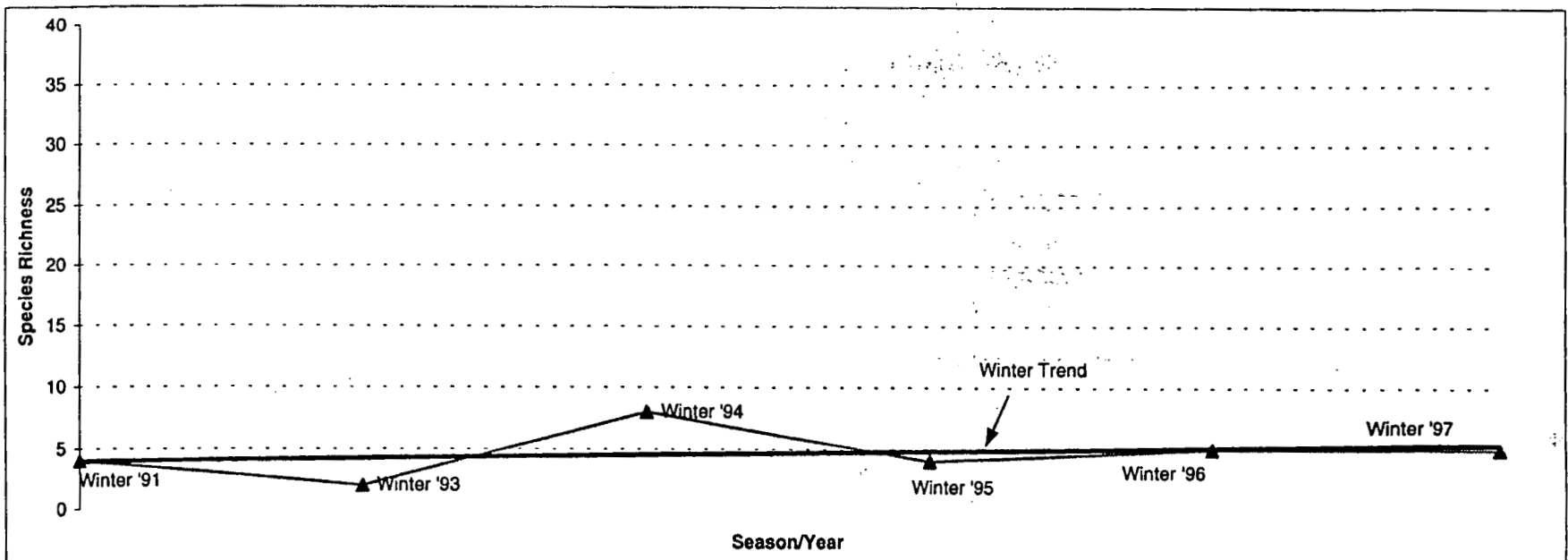


Figure W-2. Annual variation of bird species richness in mesic mixed grassland habitat during the winter months, 1991, 1993-1997.

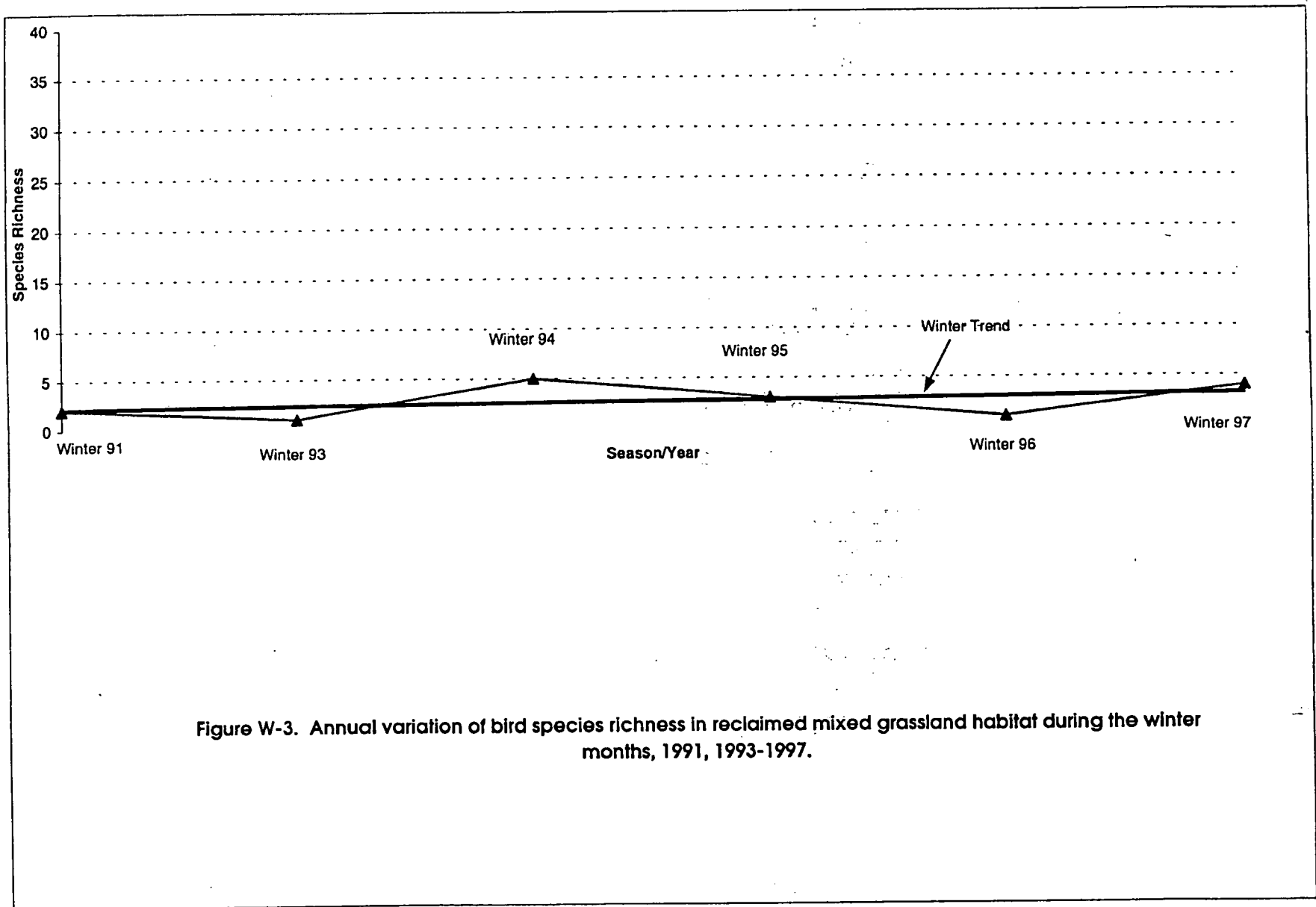
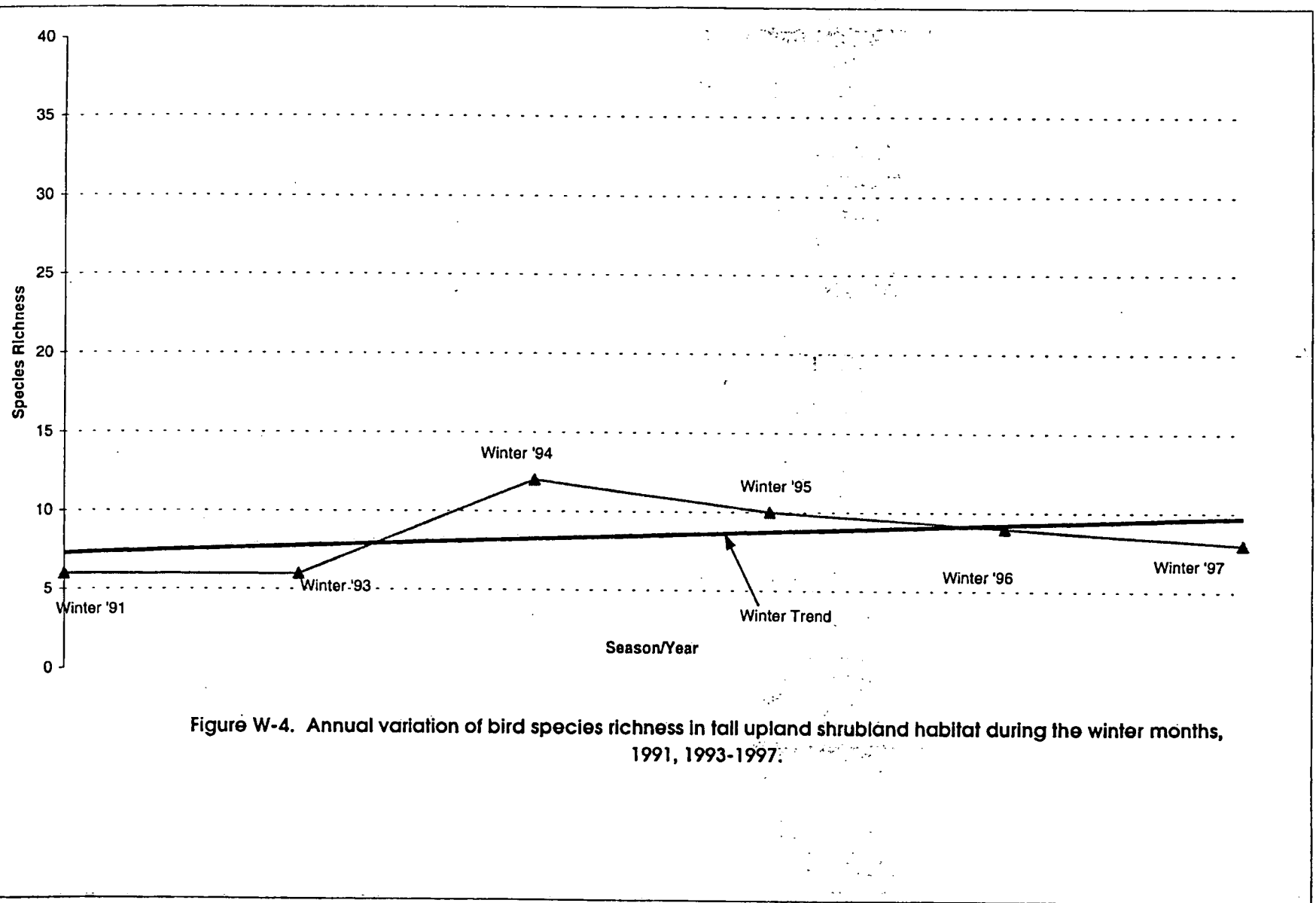
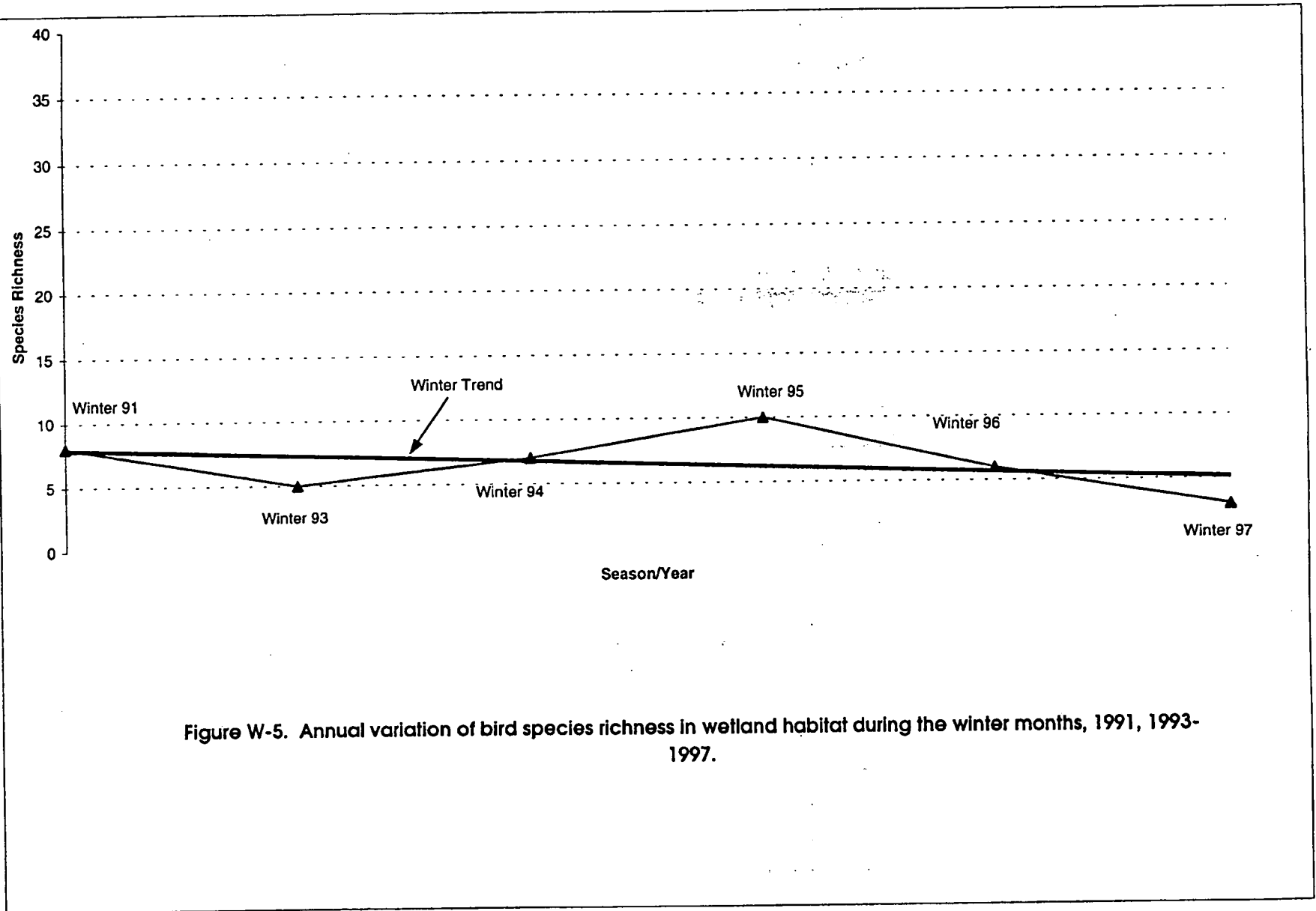
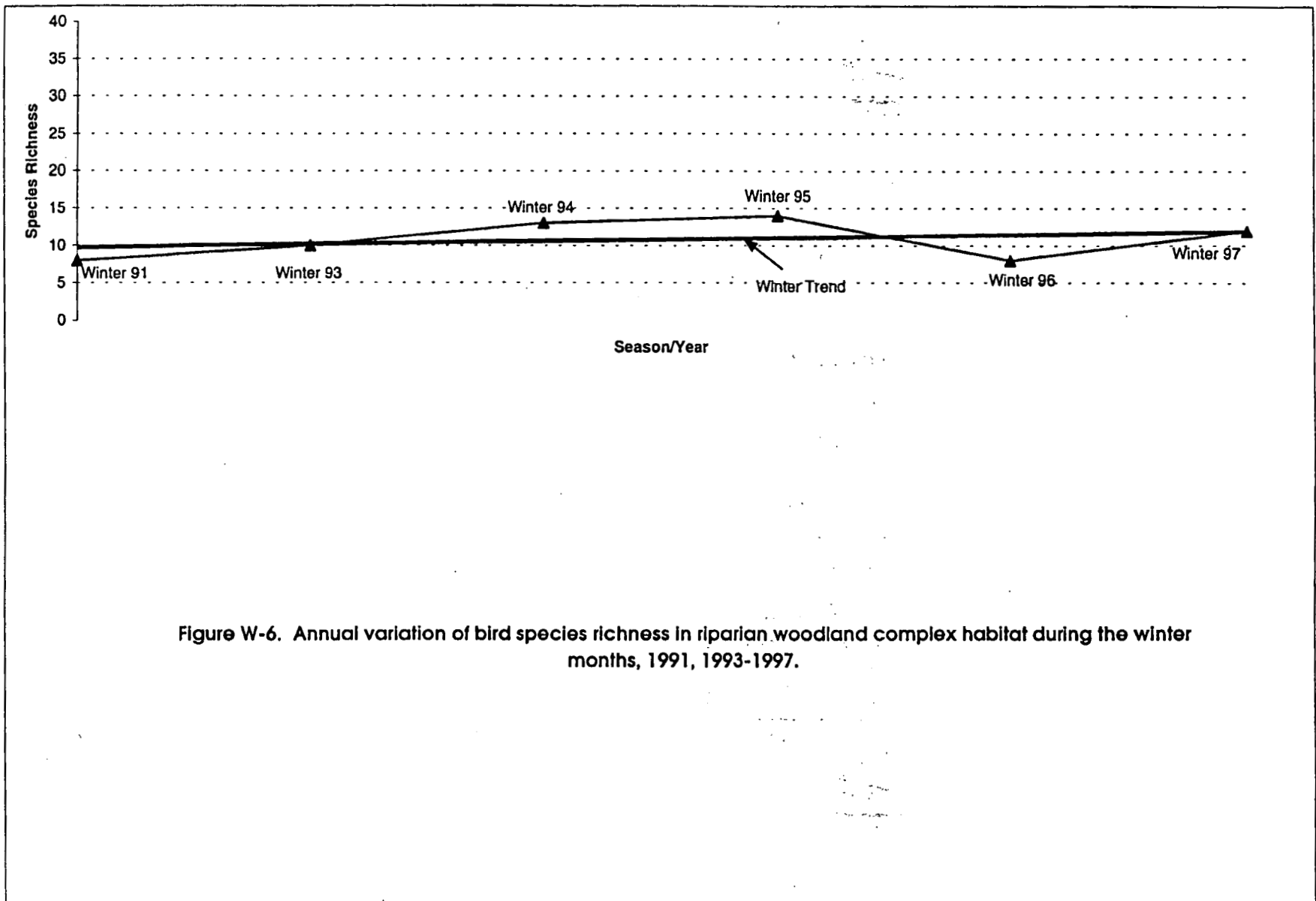


Figure W-3. Annual variation of bird species richness in reclaimed mixed grassland habitat during the winter months, 1991, 1993-1997.







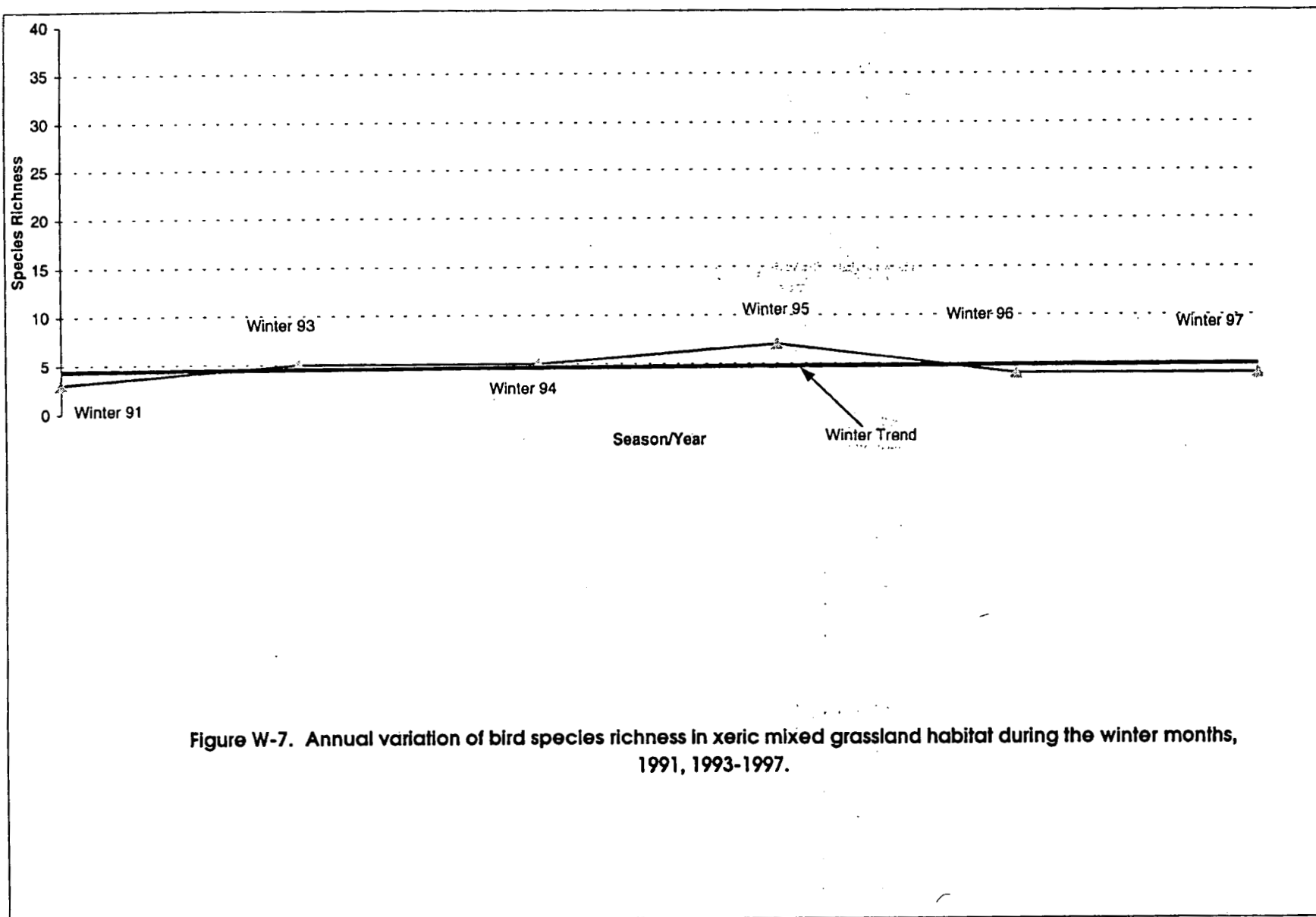


Figure W-7. Annual variation of bird species richness in xeric mixed grassland habitat during the winter months, 1991, 1993-1997.

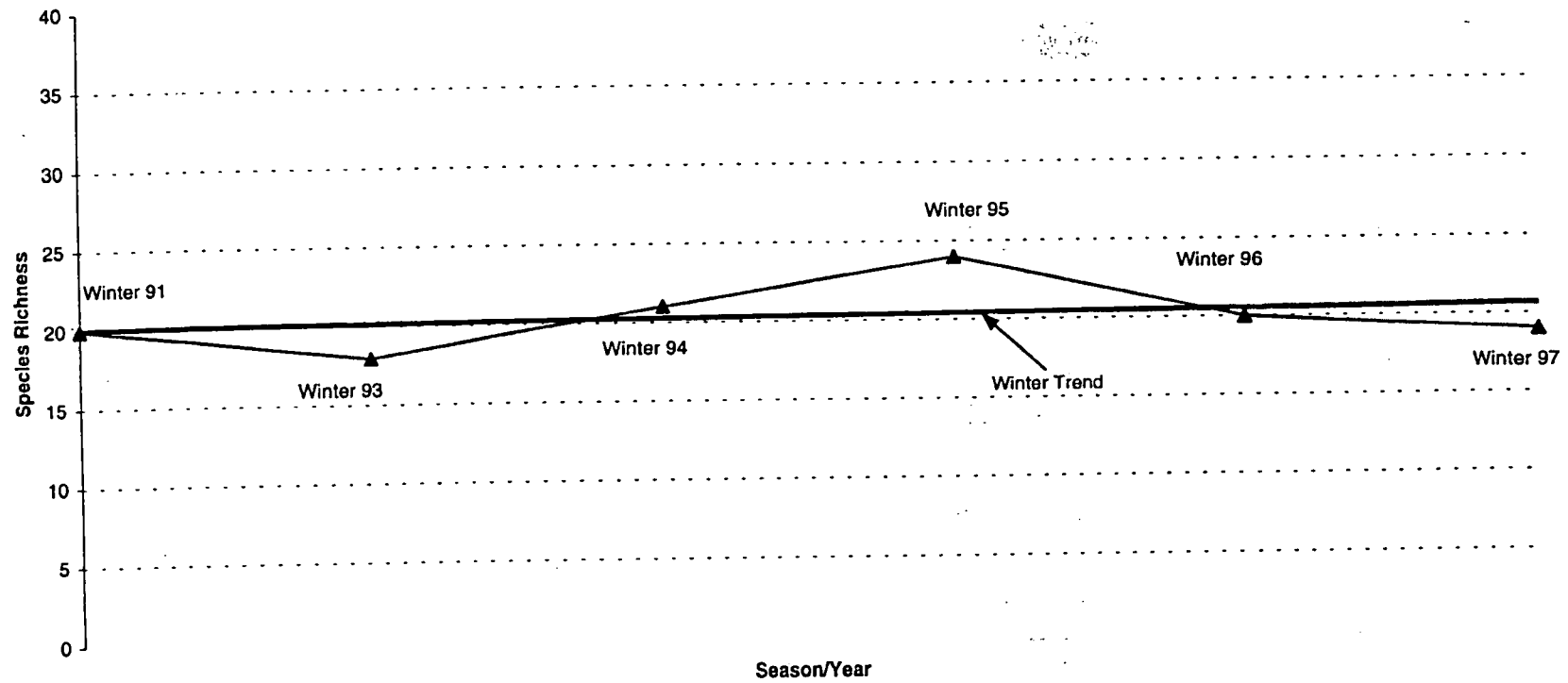
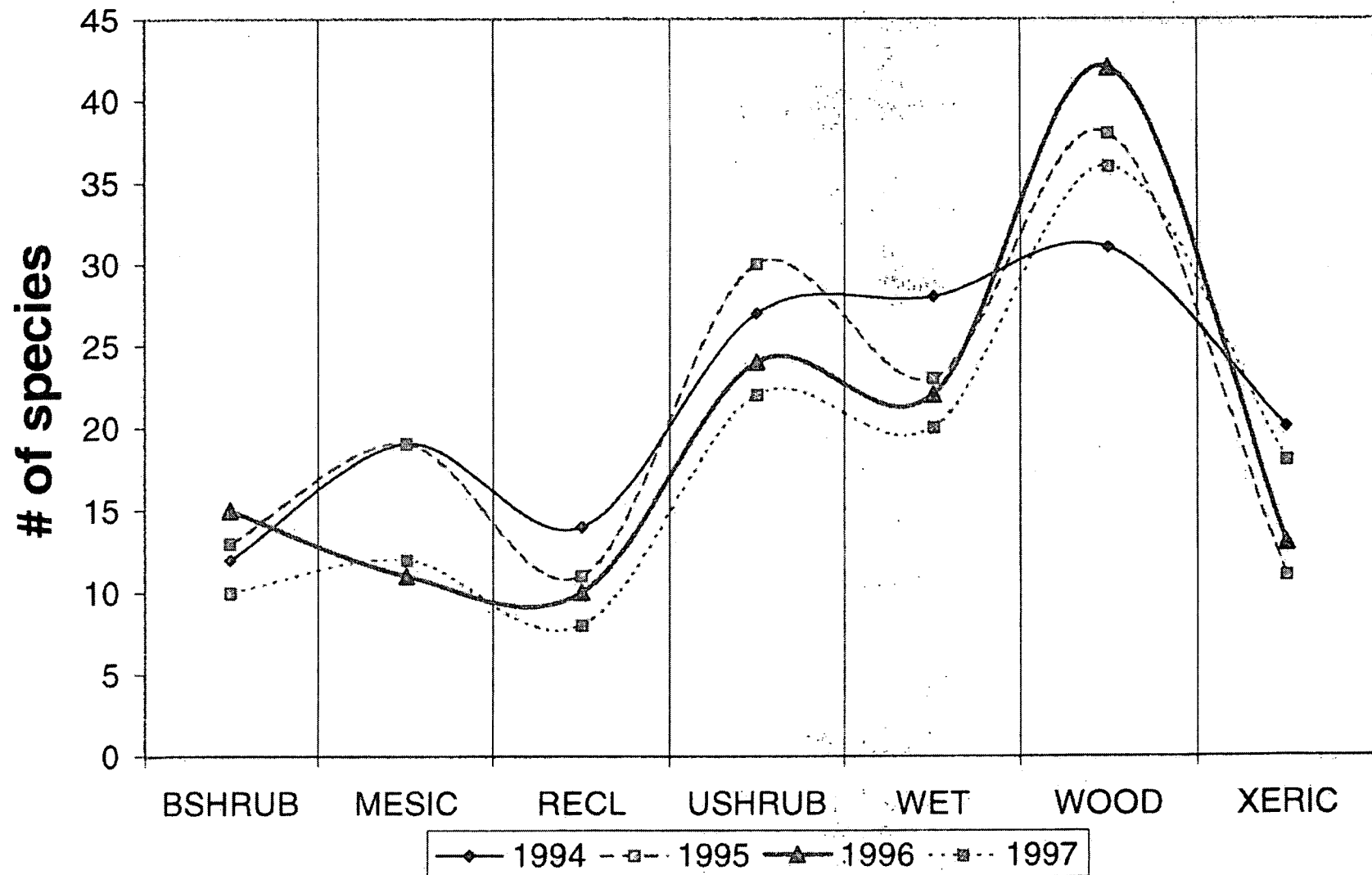


Figure W-8. Annual variation of bird species richness in all habitats during the winter months, 1991, 1993-1997.

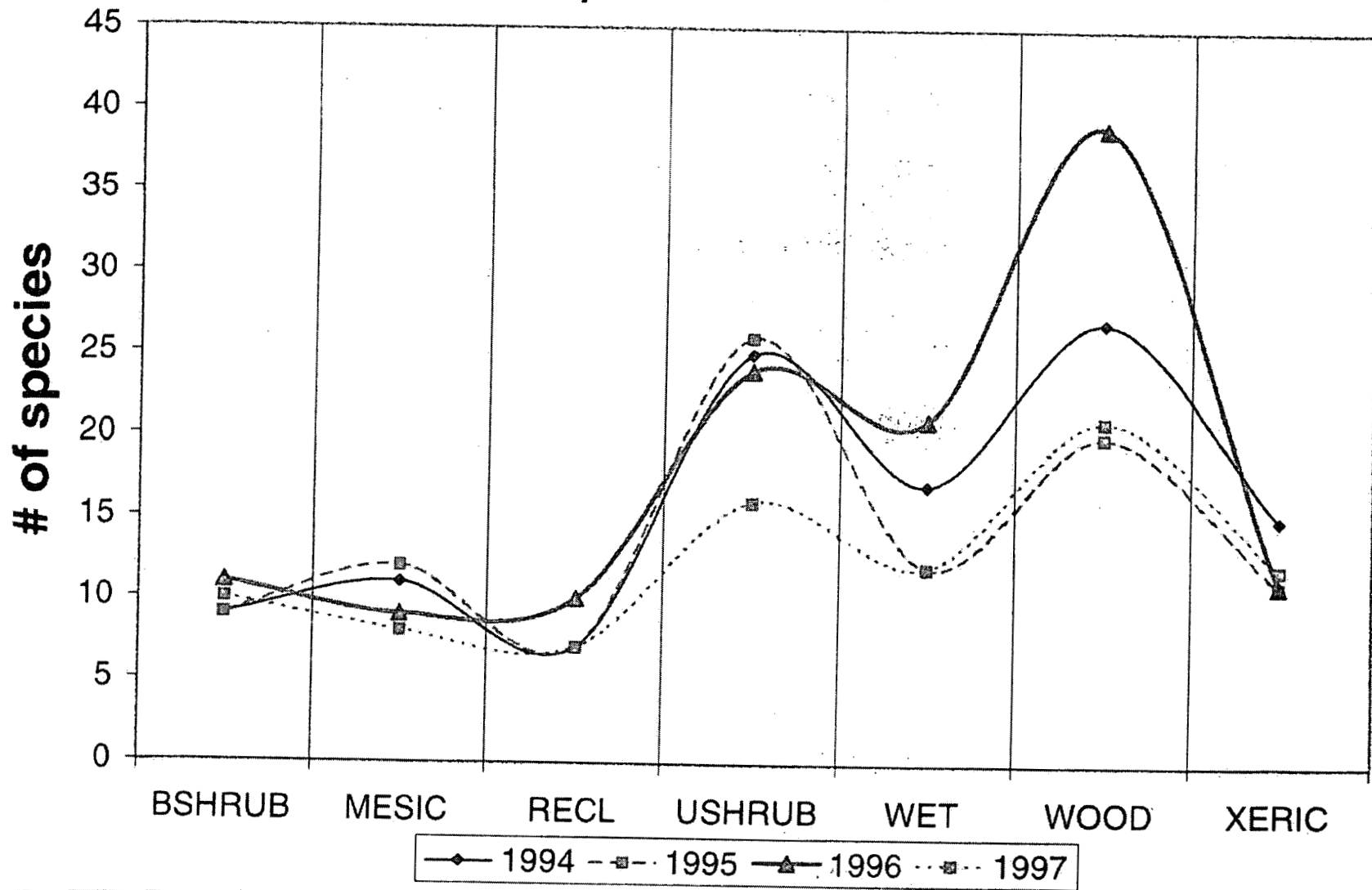
Appendix F

Migratory Season Bird Species Richness, Diversity, and Density

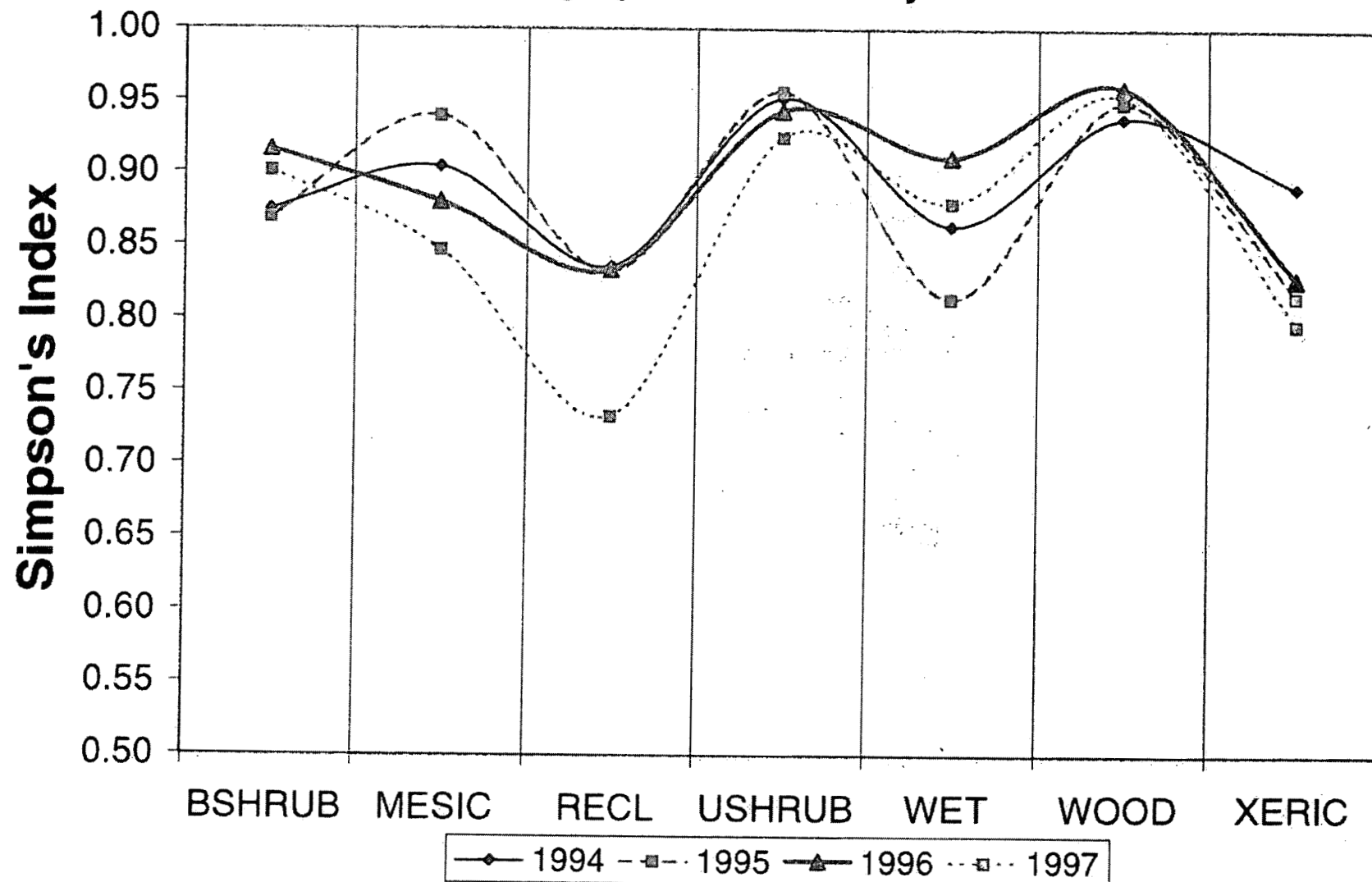
Spring Species Richness



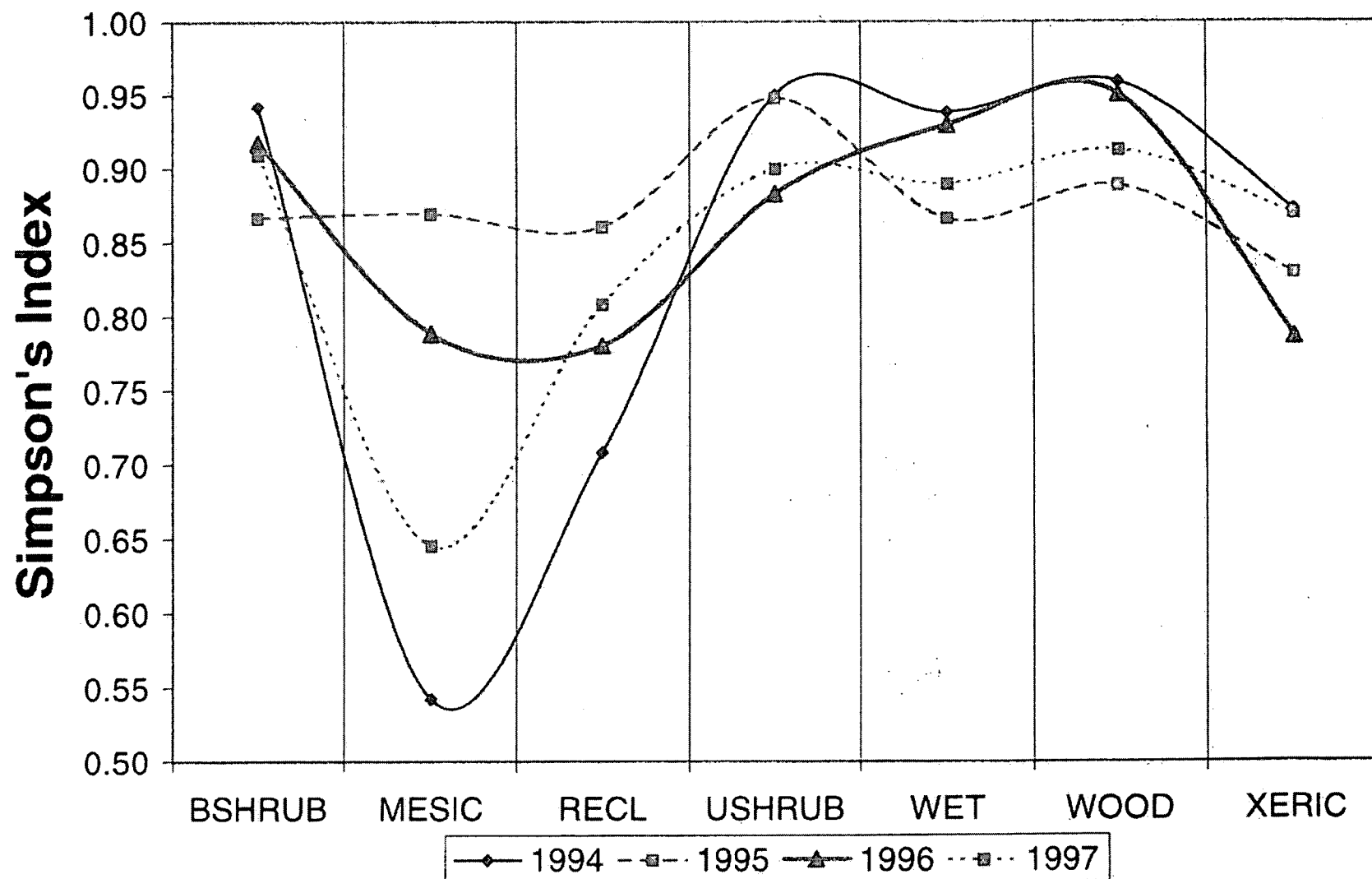
Fall Species Richness



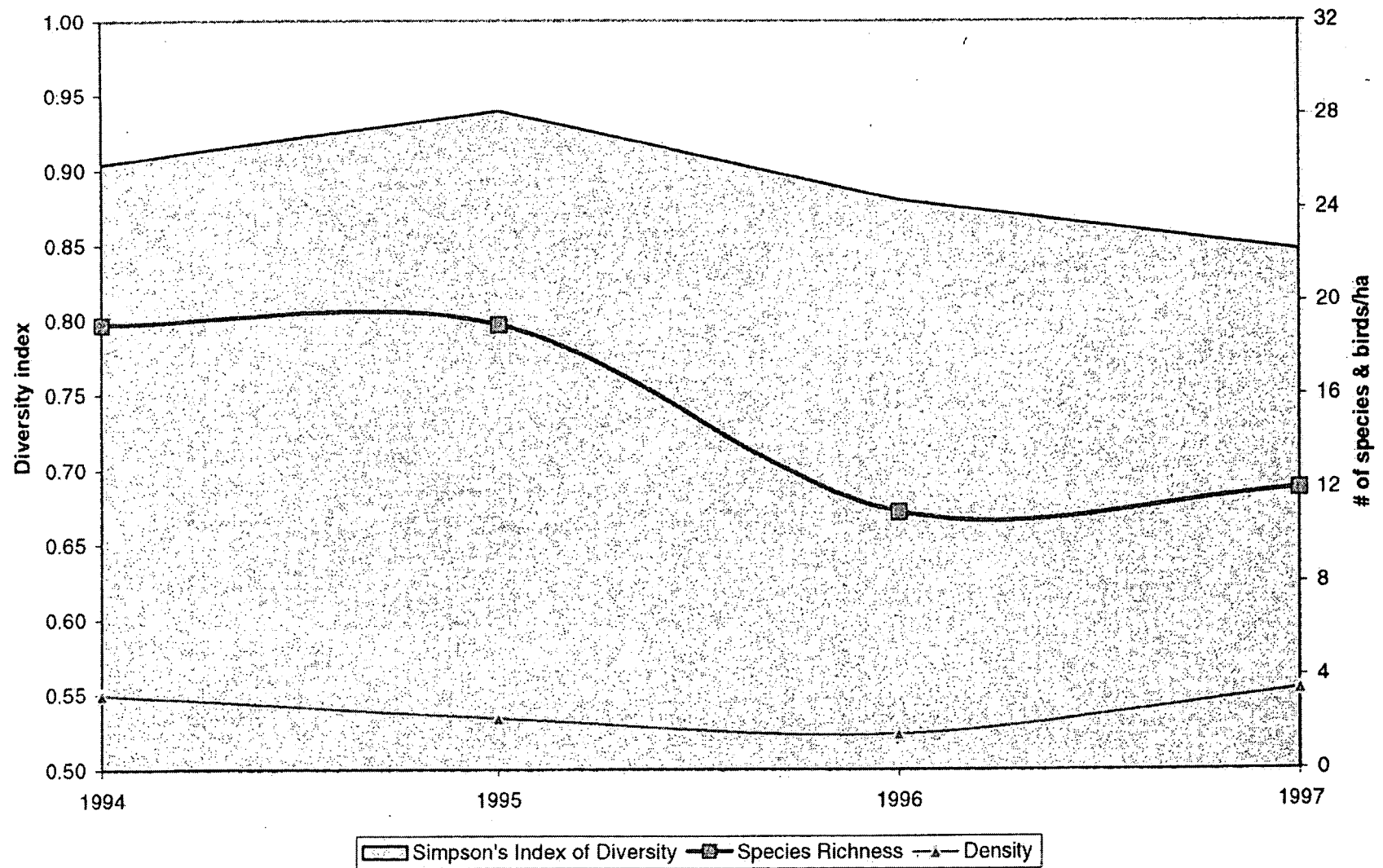
Spring Species Diversity



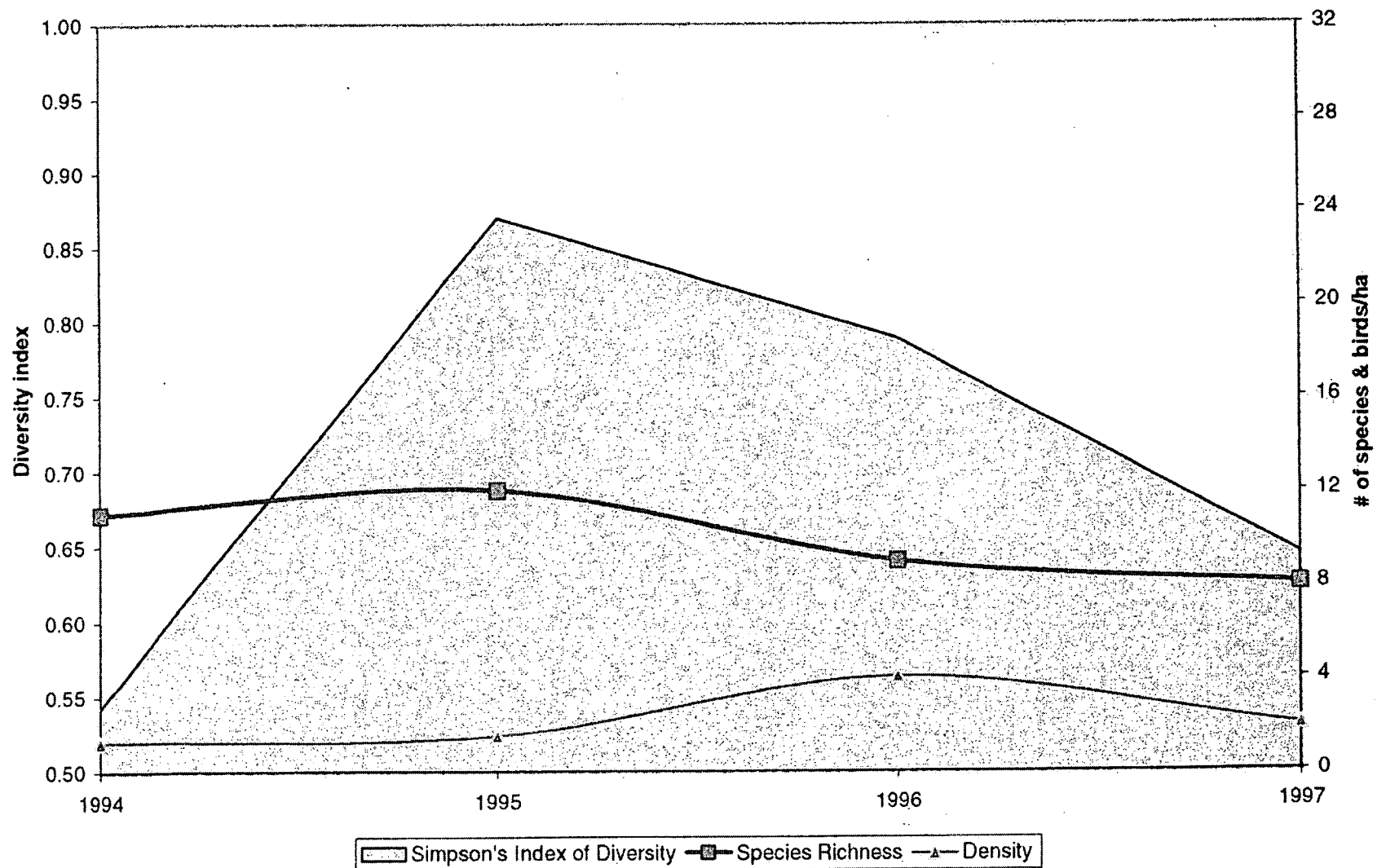
Fall Species Diversity



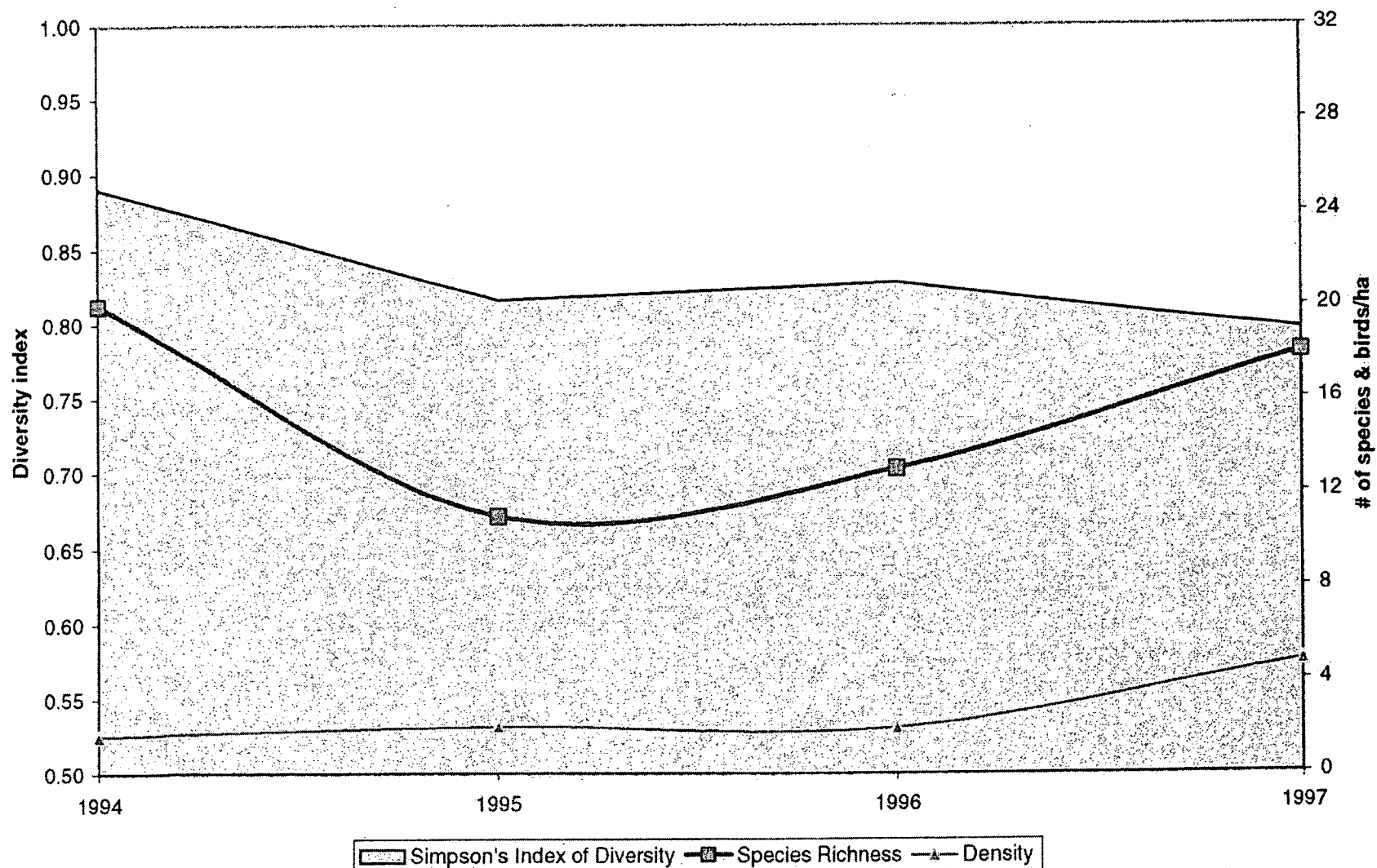
Spring bird data for MESIC



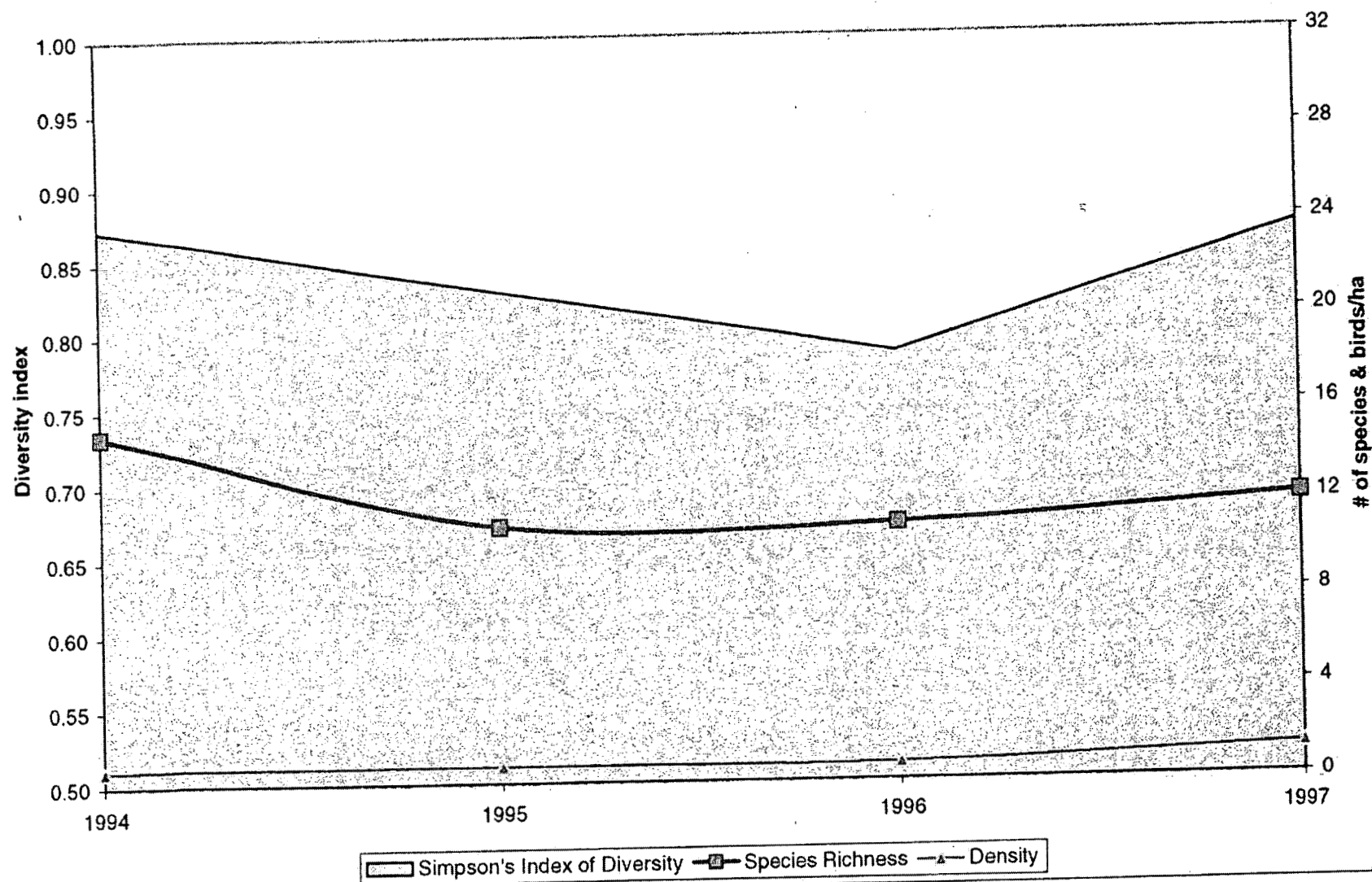
Fall bird data for MESIC



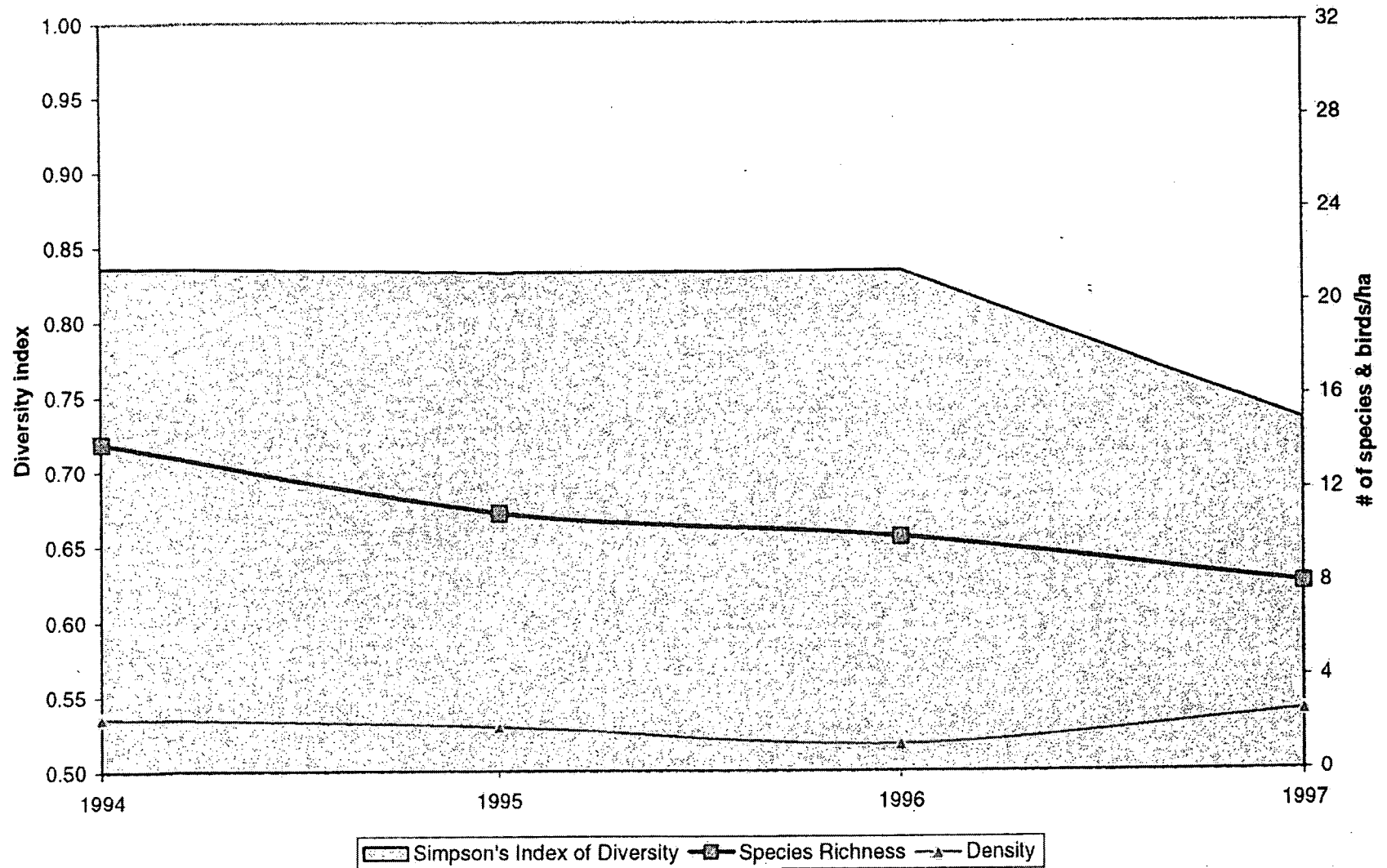
Spring bird data for XERIC



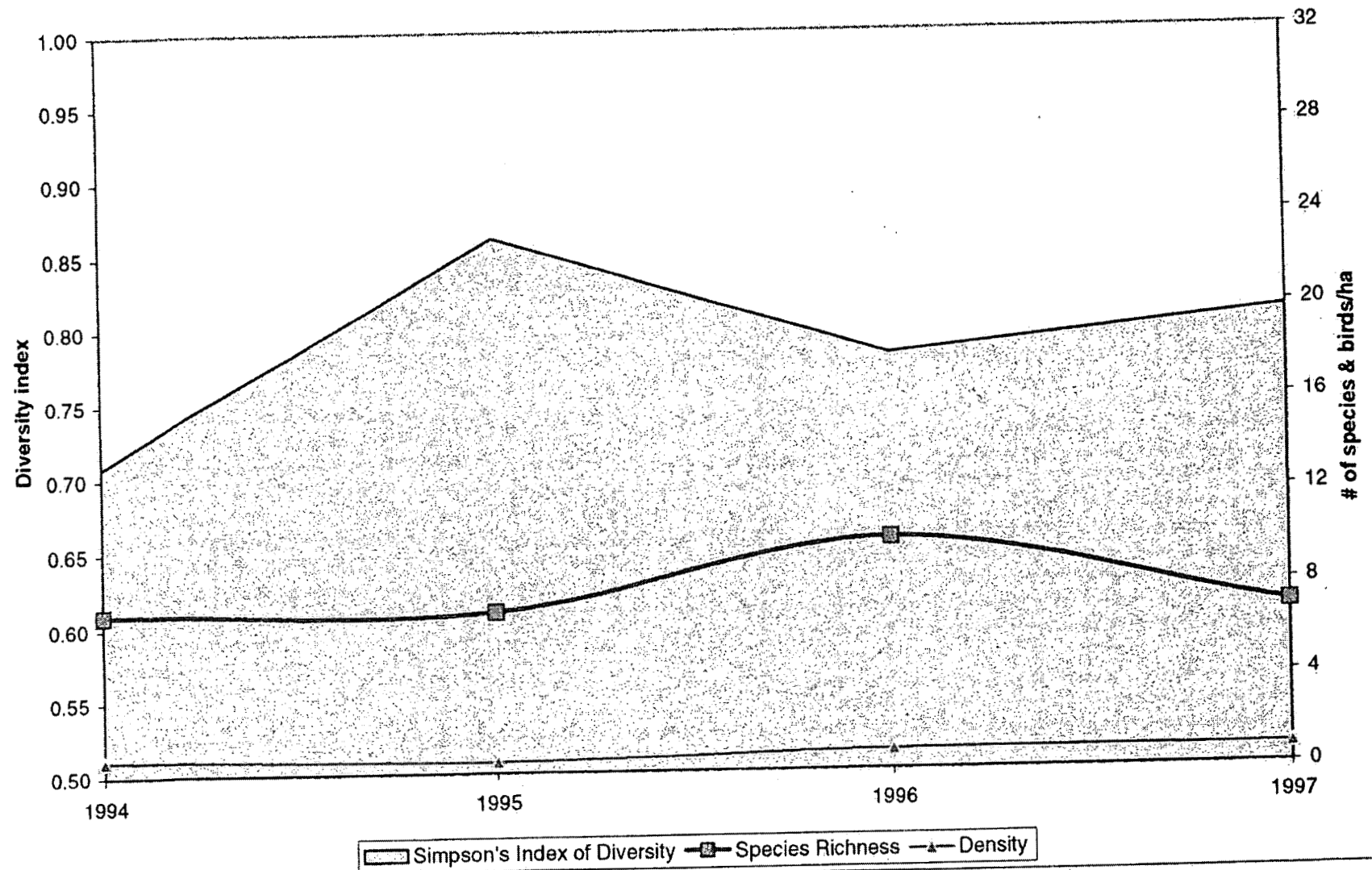
Fall bird data for XERIC



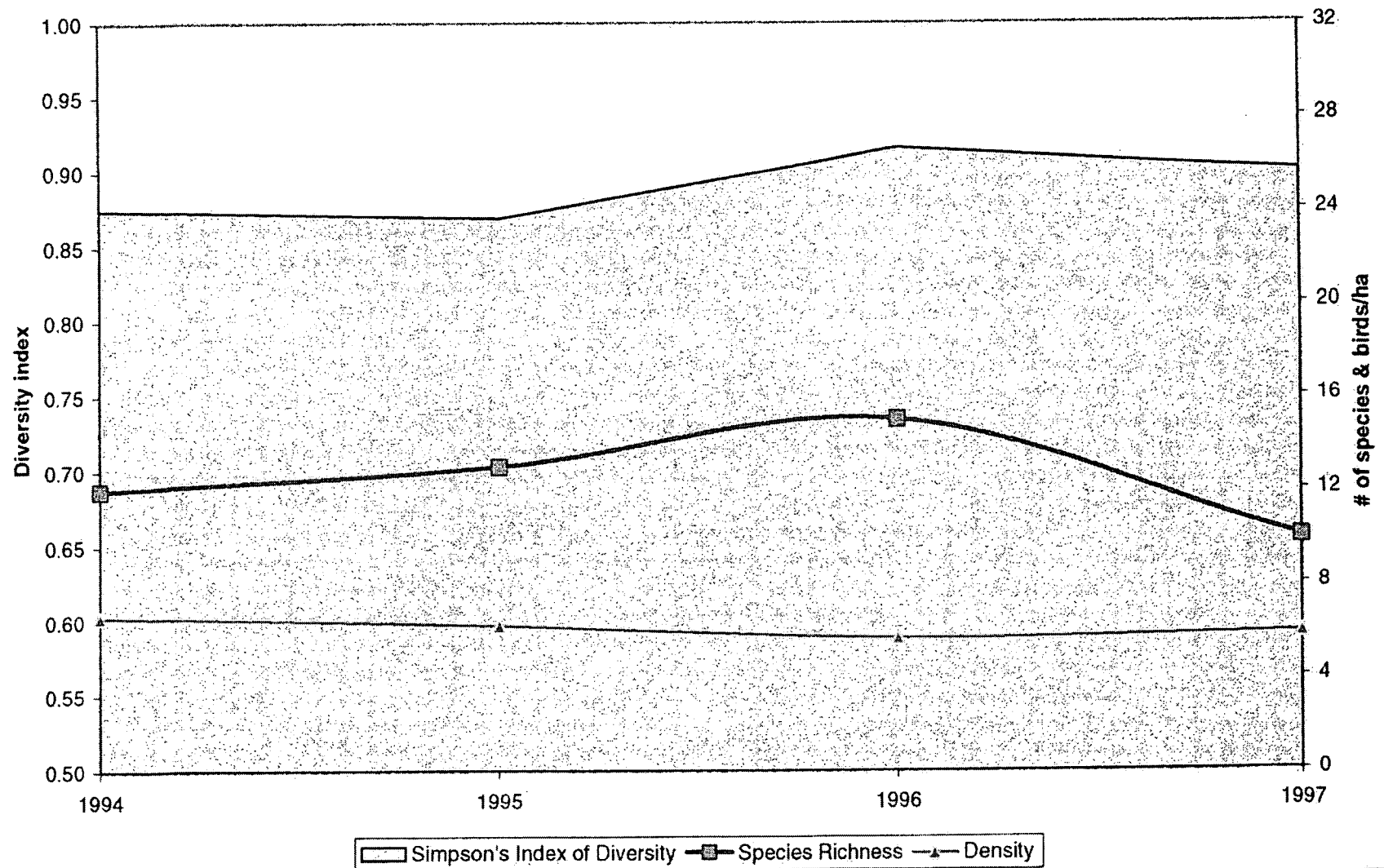
Spring bird data for RECL



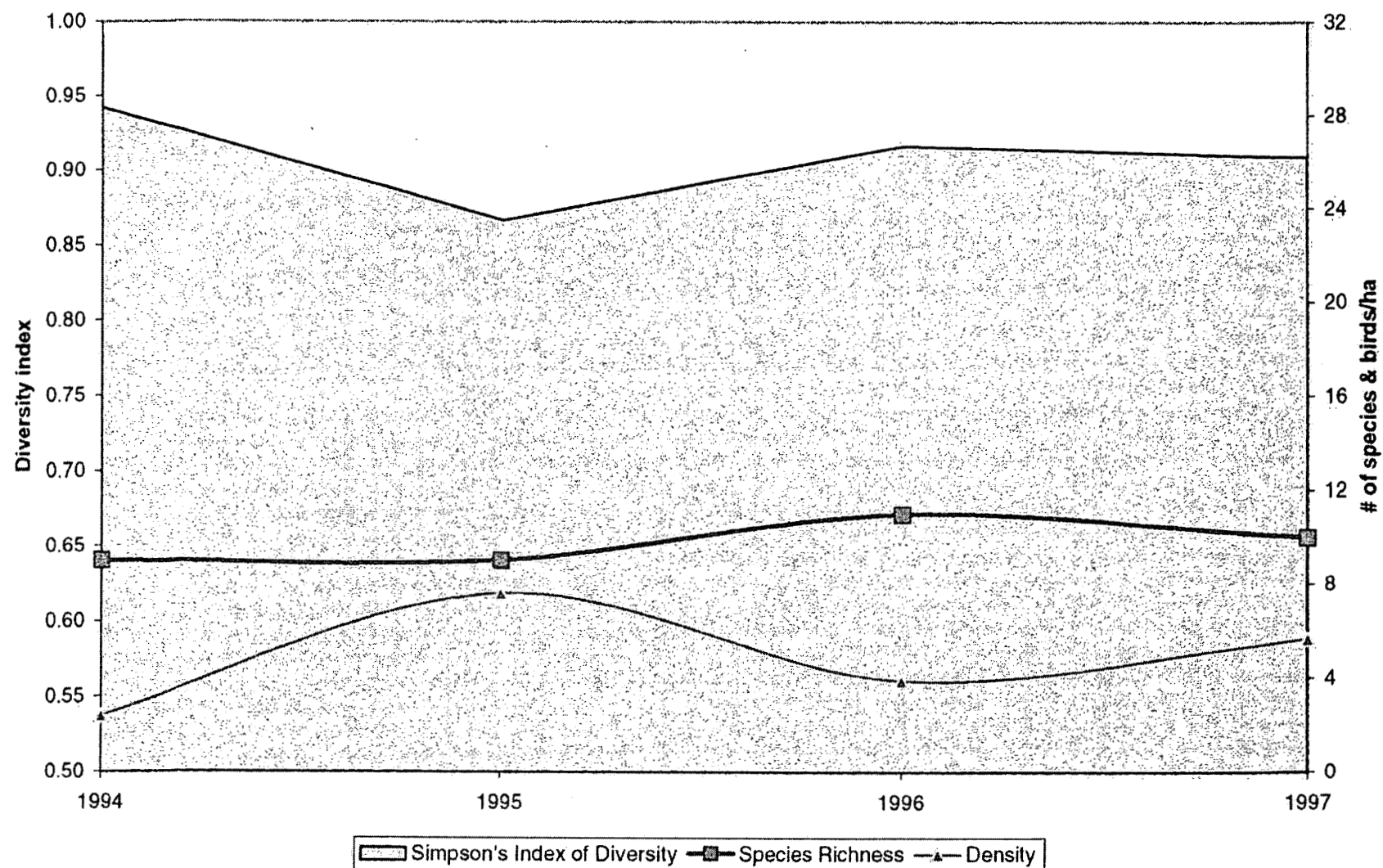
Fall bird data for RECL



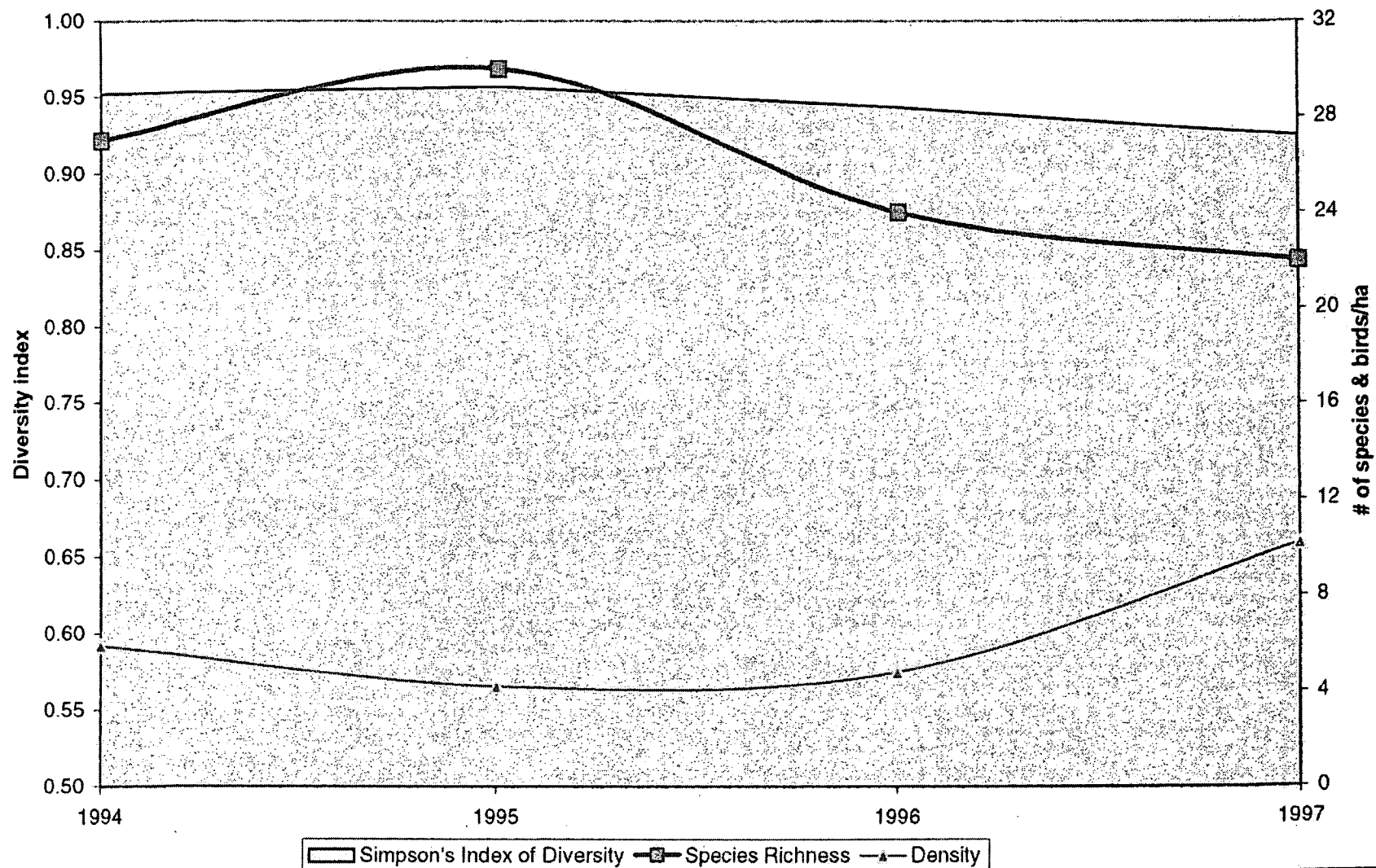
Spring bird data for BSHRUB



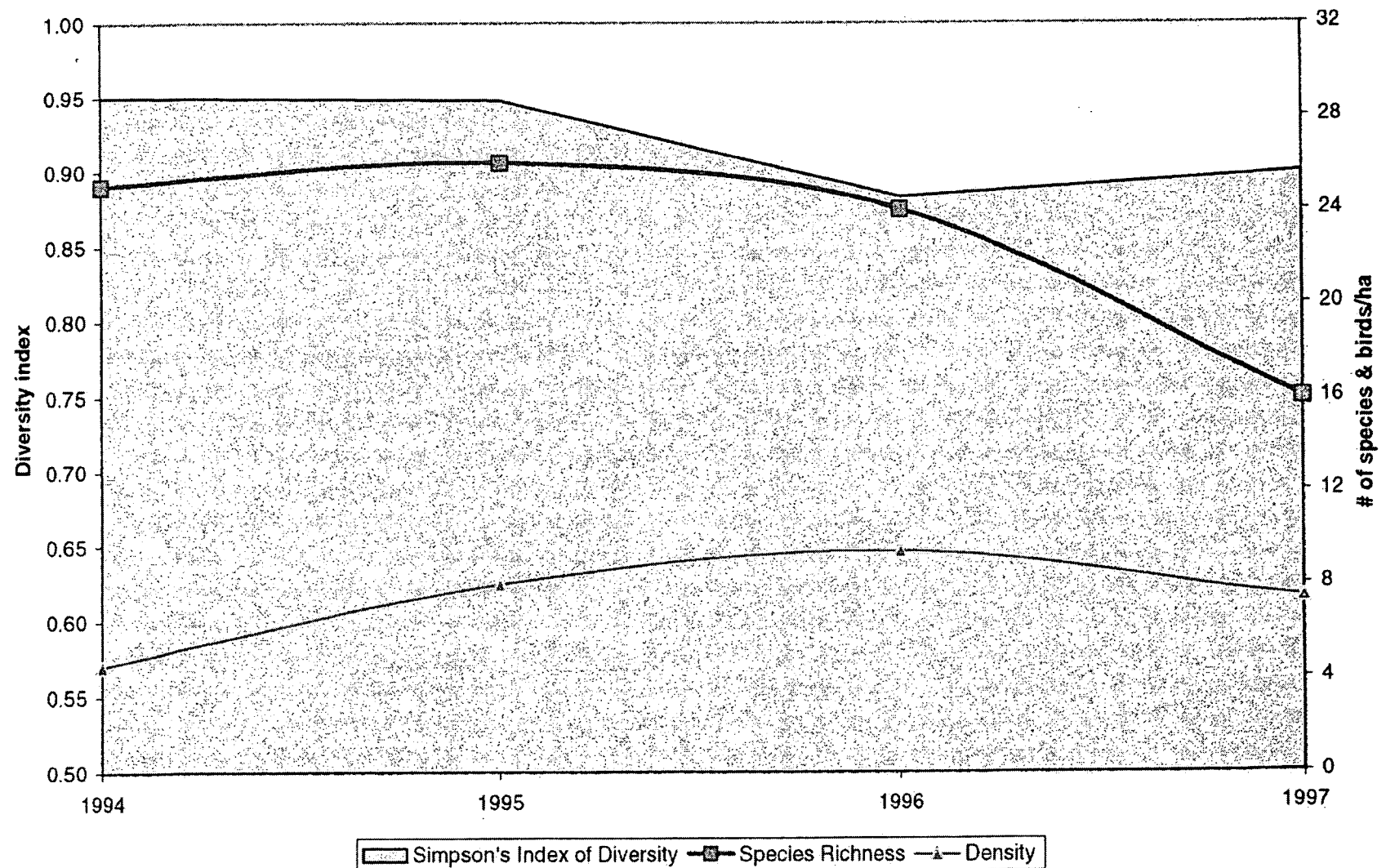
Fall bird data for BSHRUB



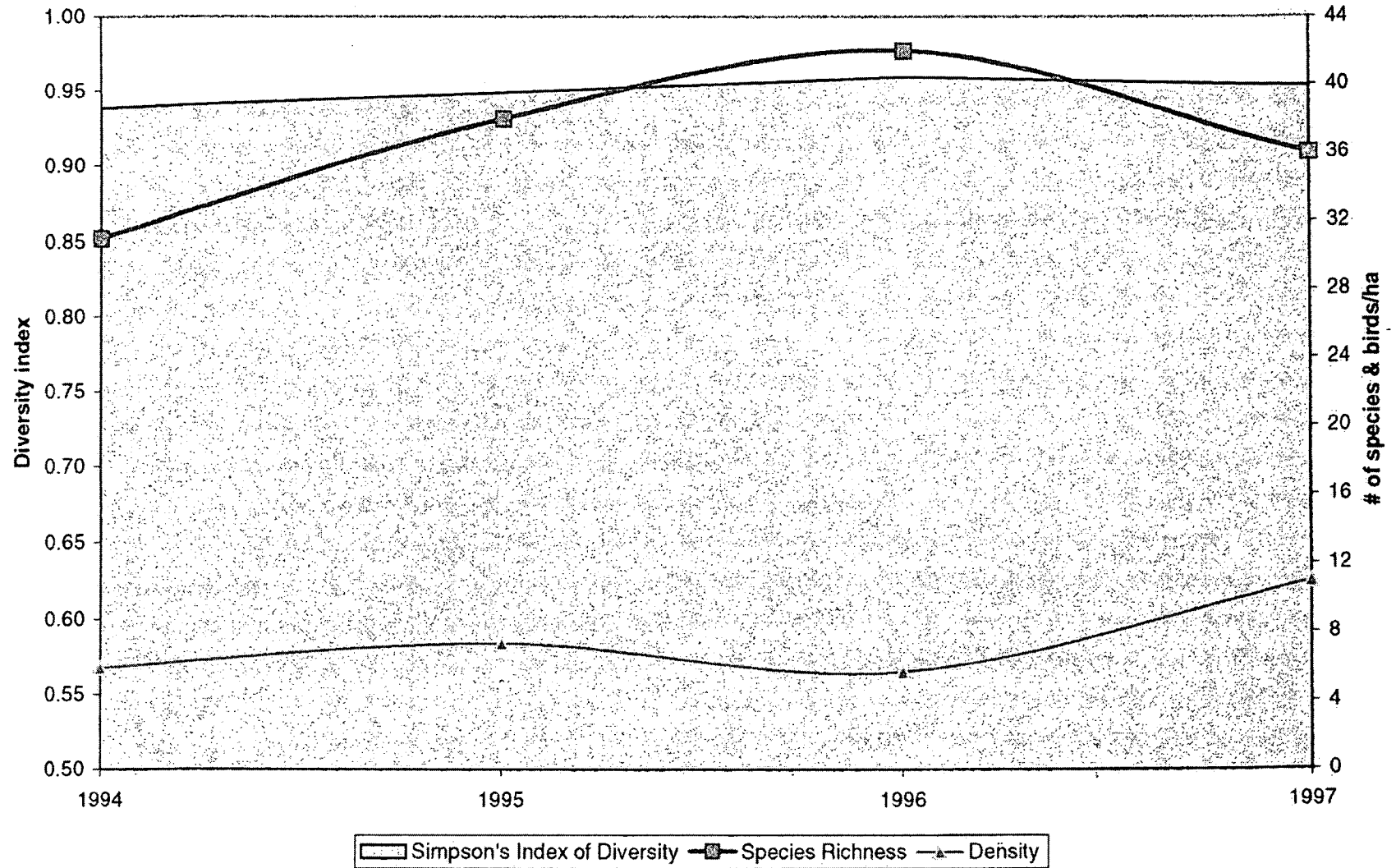
Spring bird data for USHRUB



Fall bird data for USHRUB



Spring bird data for WOOD



Fall bird data for WOOD

